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July 1958

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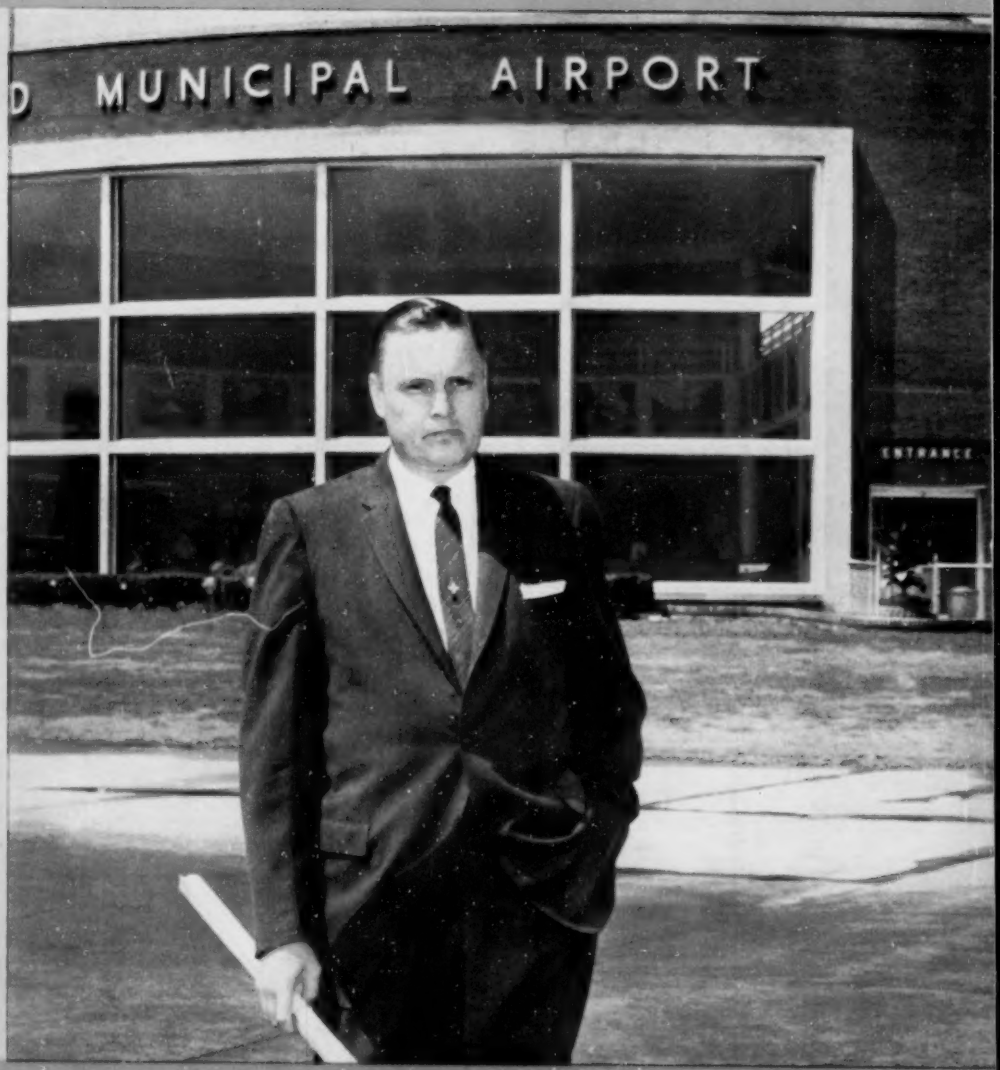

Robert S. Hopson is Director of Public Works of Richmond, Virginia. His Department provides many engineering and housekeeping services for the city and operates a harbor and an airport. More on page 18.

SAVE MONEY- SPEED ROAD JOBS!

GALION 503 MOTOR GRADER with VIBRATORY COMPACTOR

Now you can grade, spread material, and compact fills and subbase courses with ONE machine. This combination of GALION Grader and Jackson Electric Vibratory Compactor easily, speedily and economically accomplishes most specified densities—often in one pass per lift. It leaves a smooth flat surface—no waves or "washboard" effect.

FOR SPOTS OTHERS CAN'T REACH

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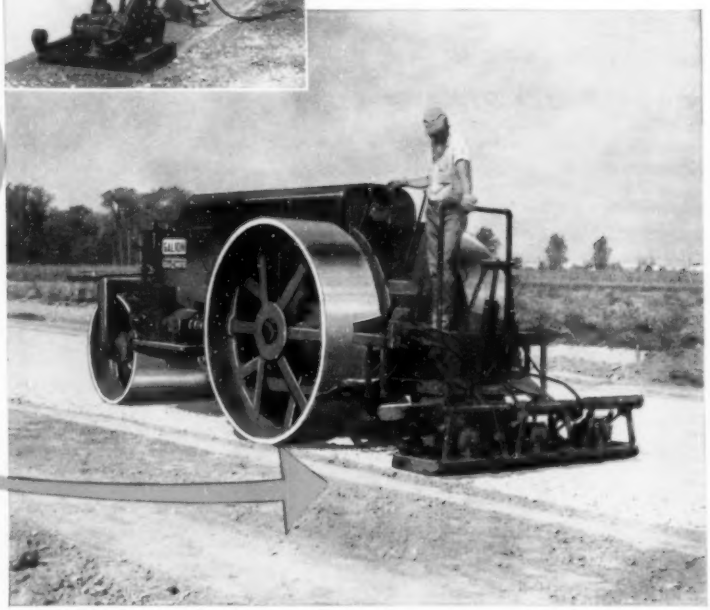
Either the "Chief" or "Warrior" model Roller with Vibratory Compactor gives you both static and dynamic compaction with ONE machine. You get the compressing action of massive roller weight plus the consolidating action of vibration (4200 three-ton blows per minute).

So effective is this double compaction effort that the most rigid Federal and State density specifications (including Proctor, Modified Proctor, and AASHO-T99-49) are often attained in ONE pass per lift.



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General and Export Offices—Galion, Ohio, U.S.A.

GALION ESTABLISHED 1907

MOTOR GRADERS & ROLLERS

Accelerated

CRP*

Sludge Digestion System

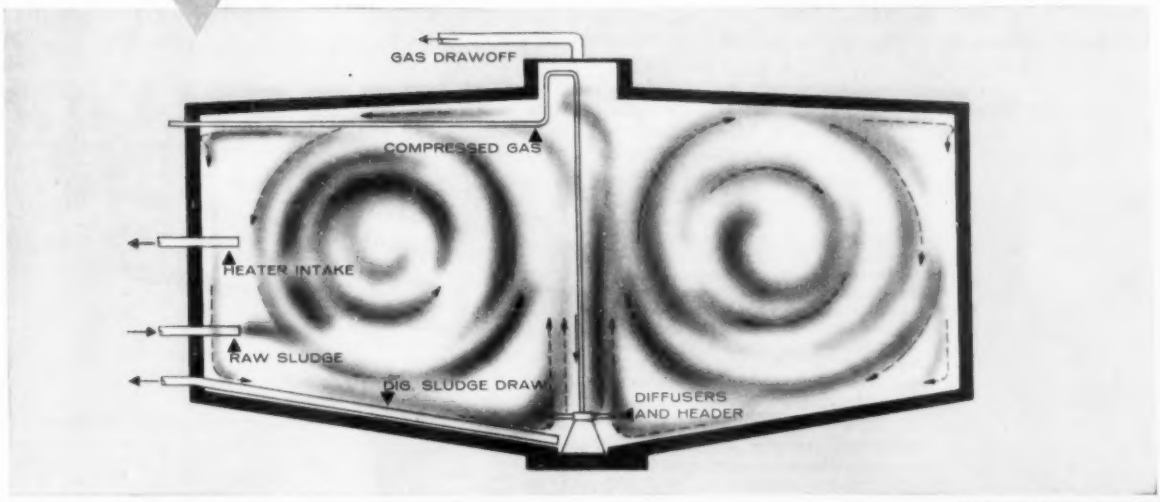
*Catalytic Reduction Process . . a trademark of Chicago Pump Company

"from Chicago"

the Accelerated Sludge Digestion System... for Unparalleled Savings

Only CRP* Has Achieved These Results

- A 3 to 7 times greater solids loading for existing tanks
- A ⅔ reduction in the size of new tanks
- Greatly reduced operating problems due to digester homogeneity
- Sludge digestion without scum



Primary CRP* Digester

THIS IS THE CRP* PROCESS

Patent Nos. 2,777,815 and 2,786,025 . . . others pending

The CRP Gas Treating System provides . . .*

- *correct biological environment for accelerated digestion*
- *continuous, complete homogeneity of digesting solids*
- *transfer of digested sludge in a homogeneous state maintained by continuous gas diffusion in the primary tank*

CRP* was tested and proven scientifically for seven (7) years prior to introduction to the field. The completely successful operation in 18 Municipal Plants since 1953, has verified this system.

Consulting Engineers may obtain specific data from Chicago Pump Company or Distributors located in most principal cities . . . concerning the application of CRP* to plants under design or plants requiring expansion.

there are 18 CRP* systems in successful operation . . . 11 more on order.

fmc
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Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION

Chicago Pump Company

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Cat No. 12 Motor Graders!

BEST BUY FOR 20 YEARS—BEST BUY TODAY!

Here's why: When the No. 12 was introduced in 1938, it set new performance standards to become the leader in this type of equipment. Today it *still* is the leader, because Caterpillar has constantly built improvements into it.

Shown here are *some* of the many changes that have been made in the No. 12 to keep it the unquestioned leader. Its exceptional dependability and high resale value are common knowledge. Dollar for dollar, the No. 12 is the most valuable motor grader that you can own.

Compare today's No. 12 with any other motor grader—compare it with older No. 12s, too. By any measure you'll find it has grown in work ability, matched to meet today's exacting construction and road maintenance needs. For complete information about this modern, heavy-duty machine, see your Caterpillar Dealer!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

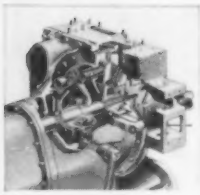
FIND YOUR CATERPILLAR DEALER IN THE YELLOW PAGES

CATERPILLAR

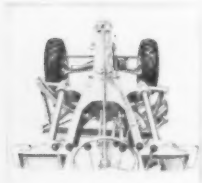
Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

NO. 12 MOTOR GRADERS—BEST BUY BY ANY YARDSTICK!

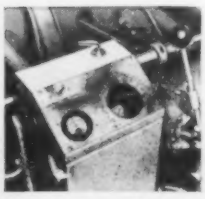
Longer main frame adds extra clearance between the toe of the blade and the front tire for all blade positions. There's ample blade maneuvering space whether the No. 12 is equipped with 13.00-24 or 14.00-24 front tires. Curved side shift rack permits fast, easy blade positioning—all common blade positions are available to the operator without leaving the cab.



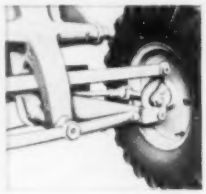
Exclusive oil clutch, the most advanced clutch design ever offered in a motor grader, provides up to 2,000 hours without adjustment. This is equivalent to about 12 months of "adjustment-free" operation. And because wear rate of clutch facings is so slight, down time for clutch repair is virtually eliminated. The oil clutch accounts for a large part of the No. 12's reputation of dependability.



Unequalled visibility results from the No. 12's dash-mounted lift gears and low frame design. While seated, the operator has an unobstructed view of the critical areas at the front wheels, toe of the blade and circle. In-cab starting and easy-to-reach controls are other No. 12 features that help the operator work more efficiently.



Optional Preco Automatic Blade Control, available only on Cat Motor Graders, controls blade slope to an accuracy of within ½" in 10', regardless of position of grader. Operator merely dials the required slope on the control, then follows the guide lines. Preco-equipped No. 12s cut conventional grading time as much as 50%.



Improved service life is built into the No. 12 with larger king pins and bushings, larger inboard spindle bearing, new steering arm pivot block with seals, improved steering booster with outboard bearing. No other motor grader can surpass the No. 12 for rugged construction—another important factor in the machine's dependability story.

Mechanical controls, standard on the No. 12, offer positive action, make blade adjustments precise. Powered right from the engine, they give a speed and range of blade movements no other unit can match. More than one lever can be operated at a time, without slowing blade movement. "Anti-creep" braking mechanism makes the blade "stay put" while under load.

Modern heavy-duty Cat No. 12 Engine features, among other advantages, the exclusive Caterpillar fuel injection system. This permits the use of economy-type fuels without fouling. The long-life reputation of Cat Diesels is well known—no other engine can match them for dependability!

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BPA

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JULY 1958

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THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

BRING ON YOUR RIVERS!

CLOW RIVER-CROSSING CAST IRON PIPE TAKES 'EM "IN STRIDE"!

EASY TO LAY. As easy to make up as a standard flanged joint. Lower labor installation cost because of ease of joint make-up and longer laying lengths.

ONLY A RATCHET WRENCH NEEDED. No split parts. Fewer parts—each joint consisting of one complete pipe, one solid follower ring, one solid ring gasket, bolts and nuts.

FULL 15° TURNING DEFLECTION with absolutely no reduction in the full internal opening area—therefore, no abnormal pressure-drops at deflected joints. Deflection stresses evenly distributed among all the bolts.

LONGER LAYING LENGTHS—approximately 18'6"—faster installation, lower costs. However, lengths may be varied to suit conditions. For example: 6 foot, 12 foot or other special lengths may be advisable to suit required curvature.

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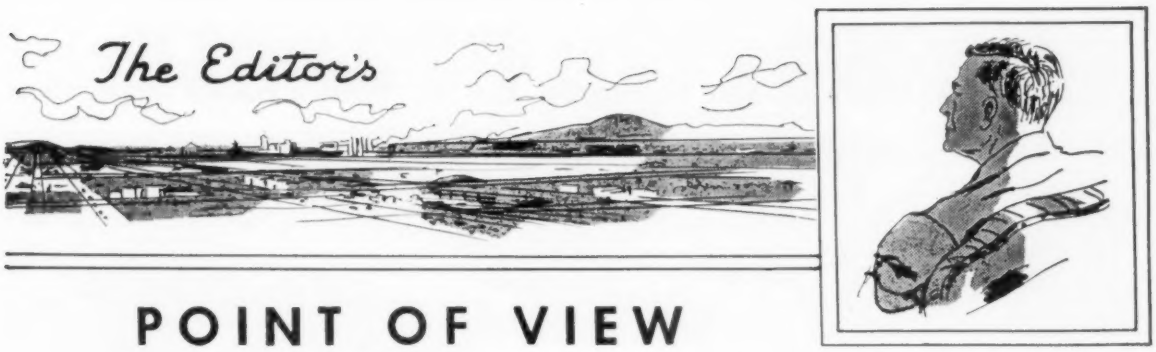

POINT OF VIEW

What the Next Ten Years May Bring in Public Works Needs

GOVERNMENTAL FORECASTS for 1968 show an estimated 205.5 million population (compared to 173 million now) and 60.3 million families (compared to 50.4 million now). There will, of necessity, be a busy time ahead for all public works engineers to meet the service needs of this increased population.

In the first place, there will be roughly a million new households each year, neglecting replacements. This means an annual minimum need for 8,000 miles of new streets, 8,000 miles of sanitary sewers and 8,000 miles of water mains, granting that practically all of these new houses will be in organized communities or in suburban areas. There will be curbs, street lighting, sidewalks, catch basins, manholes, valves and valve boxes and lots of other appurtenances. In terms of 1957 dollars, a conservative estimate of costs for these facilities is 2.3 billion dollars per year or 23 billion dollars in the 10-year period coming up.

At the rate of 100 gallons per person per day—which is conservative—there will be 320 million gallons more water needed each year—in ten years 3.2 billion gallons more. The sewage flow will also increase 320 mgd per year, so at the end of the decade we will have to treat 3.2 billion gallons more. Refuse to be handled at the end of ten years will be 40,000 tons a day more than we now handle.

In looking at these figures, it is difficult to appreciate what they mean in terms of machinery, engineering and management skill. But it ought to be clear to all that one thing needed right now is to start without delay to reduce our present backlog of needs, in men, in equipment and in services.

Getting the Right Kind of Engineering for Your Next Project

A GOOD MANY engineers practice consulting engineering; but most everyone must agree that not all of them have the same degree of skill and ability. Moreover, there are many specialties in engineering; one man concentrates on bridge and structural design; another on water plant design; another on dams. The list of special skills is not quite endless but it is large.

All of this adds up to the necessity for care in selecting a consulting engineer. The worst thing to do and the first thing to avoid is the matter of selecting an engineer wholly or partly on a price basis, either by asking openly or by subterfuge for bids or by selecting someone because of his reputation for doing work for less. The best thing to do is to select a few—generally not more than four or five—outstanding engineers in the field of work under consideration; ask them to submit a list of the jobs they have done in this field; visit some of these jobs and talk with the officials in responsible charge. Include some work that is four or five years old and see how it has served the community.

On the basis of this knowledge, select the engineer and agree with him on the details—what he is to do, what he is responsible for, what his fees will be, what they will include and when they are to be paid. Wise selection of an engineer and complete understanding of responsibility, fees, time limits and terms of payment are prime assurances of good work with satisfaction to all.

Wires in the Sky

STAND MOST any place in the average small city and you see a marvelous network of wires in the sky. These are supported on long poles and short poles, thick poles and thin poles, those with one cross-arm and those with several. Wires loop to houses and to other poles, over and under each other.

The passenger in an airplane doesn't see this network; but a recent journey on a railroad showed, from the train window, a bewildering criss-cross at nearly every station. One good whoosh of wind or just a mediocre ice storm could create a real tangle —and leave a good many people without power—one of the modern necessities of life.

Comfort Stations for Dogs

ONE OF OUR major cities is experimenting with comfort stations for dogs in an effort to relieve the highly disagreeable situation that so often exists on its sidewalks. Few of the dogs and none of the owners appear to read the "curb your dog" signs; or if these are read, the disregard for them is pretty much wholesale. Admittedly the present situation is unsatisfactory and unsanitary as well as being a constant source of complaints to health and other officials and a problem to mothers and housekeepers. A better solution than is now in sight is needed; what form this will take can not be forecast.

ANY PIPE CAN PROMISE...

50 YEARS YOUNG! This 36" Cast Iron Pipe feeder main was installed in 1907. Taken up in 1954 because of relocation project, it was relaid in 1956 for a bypass line around new highway interchange.

Close-up of section of above pipe 1,958 feet of which was cleaned and reused.

MODERNIZED cast iron

CAST IRON PIPE PERFORMS!

What other pipe offers you LONG LIFE + STRENGTH + HIGH FLOW CAPACITY?

Don't doubt when you buy pipe—specify cast iron and be sure of...

1. **LONG LIFE . . .**
   42 North American cities are still using cast iron water mains laid 100 years and more ago. Hundreds more have passed the 50 year mark.
2. **BEAM STRENGTH . . .**
   Cast Iron Pipe is inherently tough . . . stands up under heavy traffic load, soil displacement and disturbance.
3. **HIGH FLOW CAPACITY . . .**
   Cement lined cast iron pipe and fittings will not tuberculate . . . delivers a full flow for the life of the pipe.
4. **EXTERNAL LOAD RESISTANCE . . .**
   6" Class 150 Pipe withstands a crushing load of 17,900 pounds per foot . . . nearly 9 tons.
5. **CORROSION RESISTANCE . . .**
   Cast Iron Pipe effectively resists corrosion . . . vital factor in its long life and dependability.
6. **TIGHT JOINTS . . .**
   A full range of leak-proof, low cost, easy-to-assemble joints for pipe and fittings are available for all conditions.

You've read and heard thousands of words—all selling pipe.

But make no final choice before you ask this simple question: What pipe offers you not one, not two but *all* the factors that spell long, trouble-free life and dependability.

The answer is . . . cast iron pipe. Performance made it . . . and performance keeps it . . . America's No. 1 Water Carrier.

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THE MAN WHO CHOOSES CAST IRON PIPE TODAY WON'T PAY FOR IT AGAIN TOMORROW!

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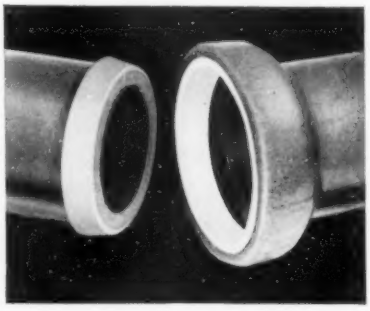
longer, stronger AMVIT Jointed Clay Pipe reduces maintenance FIVE WAYS

Factory-Made Mechanical Joint installed in over 100,000 miles of underground sewer systems



Slipshod, careless, and inferior construction methods only result in continuous maintenance, expense, and repair.

This is especially true in the construction of sanitary sewers.

Amvit* Jointed Clay Pipe was designed to eliminate the human error that often occurred when old-fashioned jointing methods were used. Tight joints are a *must*, and can only be obtained by using the best materials and workmanship. Here's why over 100,000 miles of Amvit are now in use across the nation:—

1. PREVENTS ROOT PENETRATION

Roots may force the pipe out of line and clog the system. Amvit is a compression joint on the ball and socket principle. The surfaces of both bell and spigot are in constant compression. And, since it is a bottletight joint, roots *cannot* enter the line.

2. RESISTS CHEMICAL ATTACK

Acid laden, high temperature sewage discharged from dishwashers, garbage disposal units, and washing machines will soften, warp, and blister substitute non-clay pipe. Like clay pipe, itself, Amvit Joint is not harmed by most acids, and will not corrode, decompose, or rot.

3. RESISTS ACID ATTACK

Grease and scum tend to build up inside the pipe. The resulting acid formation attacks and destroys certain synthetic substitute non-clay pipes. The design of the Amvit Joint assures that the pipe is self-centered at all times. This gives perfect alignment and self-cleansing action.

4. ELIMINATES EROSION AND DECOMPOSITION

Sand, gravel, and stones act as an abrasive and will scratch and roughen soft non-clay pipe. Because Amvit is a really tight joint, no foreign matter can possibly enter the line. And, like the pipe, Amvit Joint is unaffected by ordinary conditions of underground service.

5. COMPLETE FITTINGS

Amvit is furnished on all standard fittings as well as pipe 4″ through 24″ in diameter. This permits a uniformly tight line from house to treatment plant.

For more information on how Amvit can help cut your sewer project costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you, for this complete folder.

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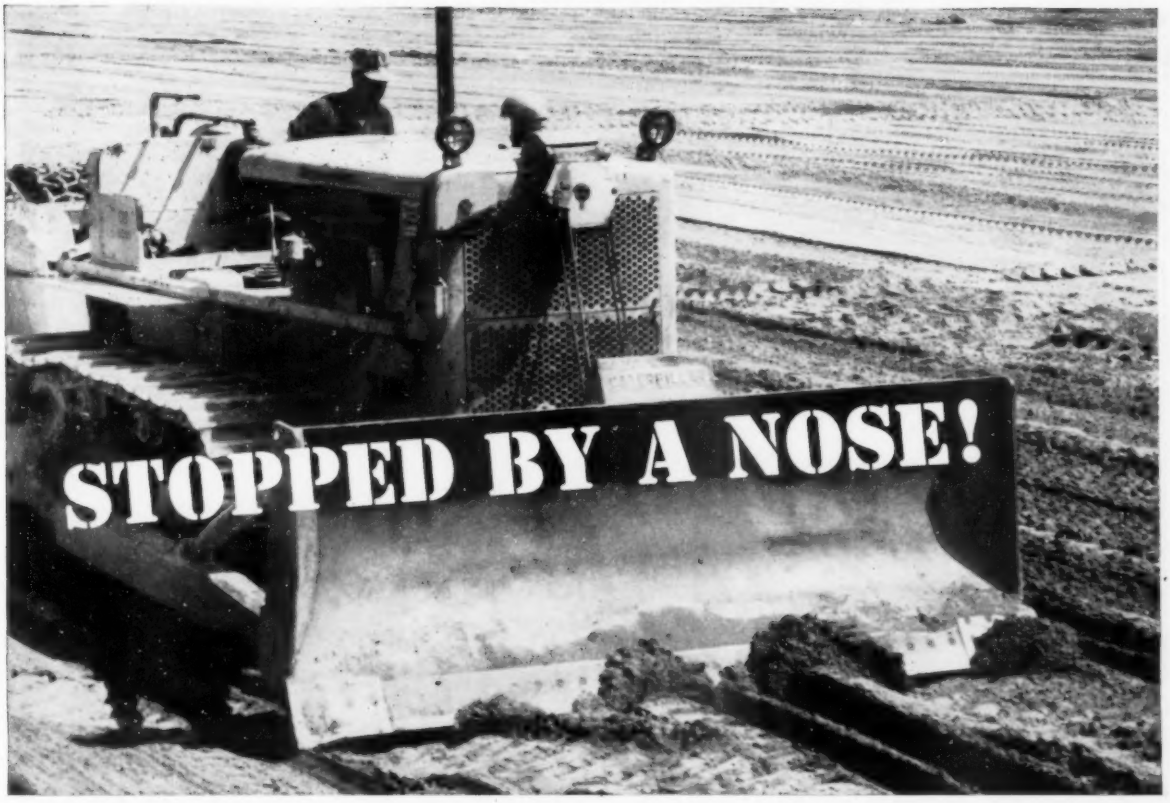

Airkem Odor Control Rescues Turnpike

Upturned noses almost stopped a $4 million dollar highway construction program in Baltimore. Contractors excavating for one of the city's new super-highways hit an invisible obstacle no 'dozer or drag-line could handle. No construction equipment could cope with the sour stench from a rotted garbage fill that had to be replaced with some 300,000 yards of solid road bed. Odor complaints from nearby residents threatened to halt the project. Confronted with the serious loss of a work stoppage, the Langenfelder Construction Corporation called on Airkem for help.

The local Airkem distributor was called in. After several test applications an Airkem formulation originally developed to counteract rendering and garbage odors was selected. When sprayed on the exposed fill this Airkem odor counteractant completely neutralized the objectionable smells. Work proceeded on schedule with no further incidents.

Airkem odor controls are extensively used by industry and municipalities to treat odor conditions often regarded as impossible to control economically. Whenever odor problems arise in municipal maintenance programs such as sewage treatment, land fills and flooded areas, Airkem odor control experts should be consulted. Airkem odor control is also used to treat odors indoors. In every type of plant or office, for virtually any odor, Airkem equipment is available to make working conditions pleasant and clean-smelling.

If you have an odor problem, an Airkem field engineer undoubtedly can help you solve it. Write for information on this world-wide service.

airkem

Airkem Odor Control and Sanitation Products

Applying Airkem solution to exposed fill. Odor control is effective and low in cost.

AIRKEM, INC. PW-7
241 East 44th Street, New York 17, N. Y.

Please send me information on Airkem Odor Control.

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Title_____

Organization_____

Address_____

City_____ Zone___ State____

Transite Pressure Pipe is tested to AWWA specifications

says Walter Reynolds
Mayor, Providence, R. I.

"An efficient water system ranks high among the many advantages Providence offers industry"

"Since 1935, Transite Pipe has ably served in the continuing job of keeping our water system more than capable of meeting future needs. In this way our water system contributes not only to the health and convenience of our citizens, but also to the encouragement of industrial and economic growth in our city."

How Transite Pressure Pipe helps make community water systems even better investments

Few community investments bring a greater year-in, year-out return than a modern water supply system. For it favorably affects every phase of community life—adding to comfort, convenience, fire-safety . . . contributing to an active, growing business climate . . . saving tax dollars for other uses.

With Transite® water mains, your community water system can offer still further advantages through design—installation—and in-service economies.

Systems can be designed more efficiently. With a flow coefficient of C=140, Transite's high carrying capacity often permits use of smaller pipe diameters. And because Transite can't tuberculate (a form of interior corrosion) there's no need to make costly allowances for future reduction in carrying capacity.

Installation is more economical. Lightweight, easy-to-handle, quickly assembled with the Ring-Tite® Coupling—Transite reduces substantially the costs of time and labor. And in service, the Ring-Tite Coupling brings a tight, lasting seal to every joint in the system.

System is operated at lower cost. Because Transite can't tuberculate, its smooth interior stays smooth indefinitely to assure peak pumping economy.

Let us send you booklet TR-160A. Write Johns-Manville PW Box 14, New York 16, N. Y.

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You Can Buy

Rockwell Quality and Service Make the Difference

Rockwell disc meters, both Arctic and Tropic types, contain a host of engineering advances. Consider the advantages offered you by just these three:

STAINLESS STEEL TRIM
You can't beat stainless for corrosion resistance and durability. In Rockwell disc meters, stainless steel is used lavishly at all points where these superior qualities are required.

"O"-RING STUFFING BOX ASSEMBLY—stops leaks, binds, troubles and expense. This patented construction foils friction at a really vulnerable point. Hence Rockwell disc meters run more freely, stay accurate longer.

LARGE RED CENTER TEST HAND—on all registers, provides a closer check on accuracy; offers a convenient means for the determination of leaks on customers' premises.

Let the Rockwell representative prove that Rockwell offers you the best disc meter buy. And remember, you can get prompt, off-the-shelf delivery from your nearby Rockwell warehouse. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

DISC TYPE WATER METERS

another fine product by

ROCKWELL

TONS OF GOOEY WASTE... but a FORD Tractor-Loader

1.

H. C. Hackett of Williams Bay, Wis., looks over part of the residue drawn from the city's water during his 13 years as superintendent. Every ton of lime used in the water softening system draws off 3 tons of heavy, sticky waste at the settling beds.

3.

The problem was solved with several strips of plywood and a Ford Tractor-Loader. The compact rig easily moves into the bed through the tiny entry. The unit "floats" over plywood strips laid on the sand as work moves forward. Bucket tilt-back holds each load without crumbling.

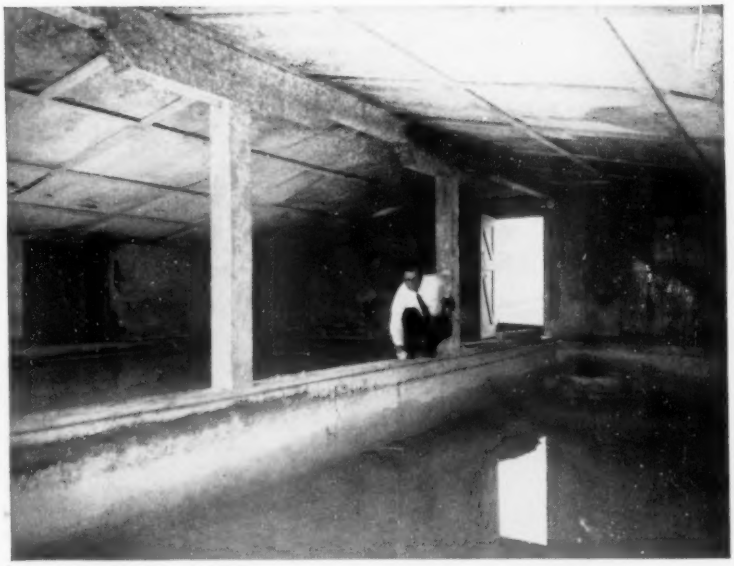
Ford
TRACTORS AND INDUSTRIAL EQUIPMENT

You see more

"IMPOSSIBLE" FLOTATION... solved the problem

2.

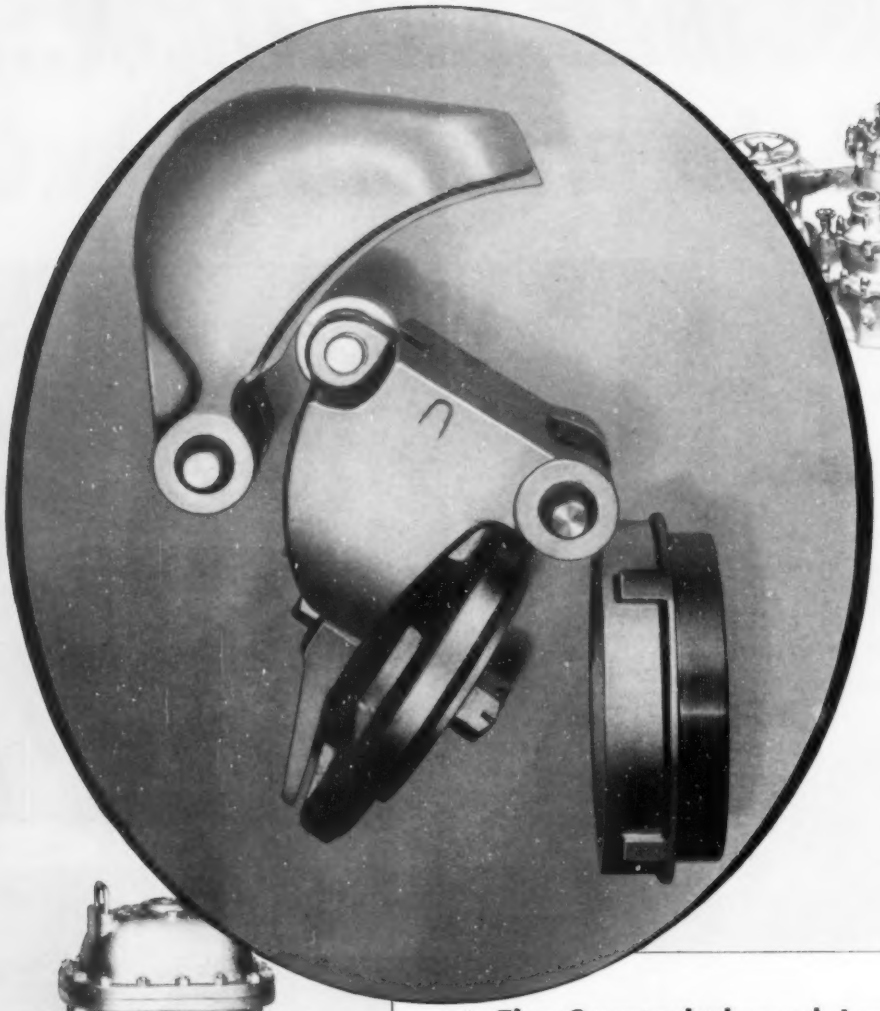
Three sand and gravel filtering beds are worked in rotation, one cleaned every 5 days. For years, 3 men sweated over the thick layer of paste-like waste with hand shovels. Conveyors were no help, only churned the residue into liquid. Tractor-loaders sank to their hubs in the sand.



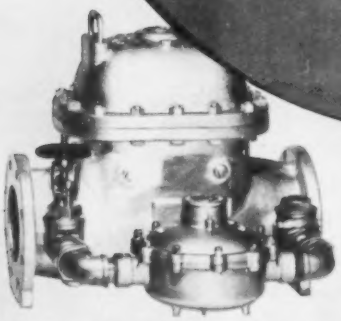
4.

Just a fraction of the time and man-power formerly spent—and no exhausting hand labor . . . another example of how ingenuity and Ford can be used to whip almost any job problem. How about *yours*? Talk to your dealer or write to: Tractor and Implement Division, Ford Motor Company, Birmingham, Mich.

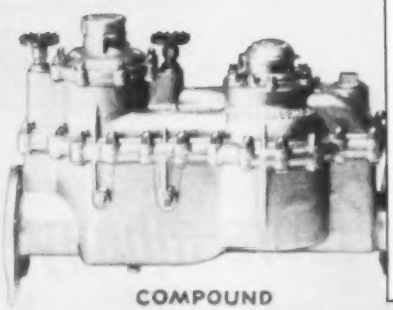
FORDS *because they save more money!*



DETECTOR
(FIRE LINE)



DETECTOR CHECK



COMPOUND

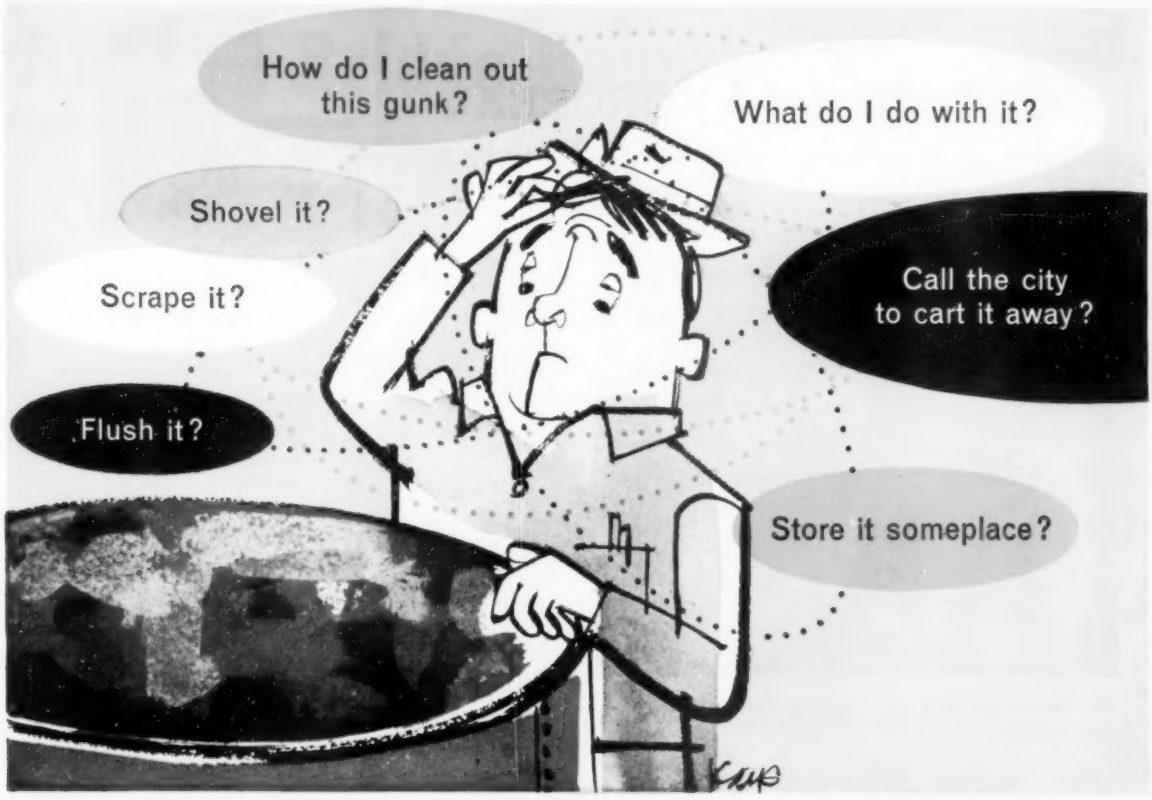
The Counterbalanced Lever Valve
is an exclusive - outstanding - time tested
feature of the larger

HERSEY
WATER METERS

where the accurate registration
of all rates of flow is so necessary.

HERSEY MANUFACTURING COMPANY
DEDHAM, MASS.

BRANCH OFFICES: NEW YORK — PORTLAND, ORE. — PHILADELPHIA
ATLANTA — DALLAS — CHICAGO — SAN FRANCISCO — LOS ANGELES



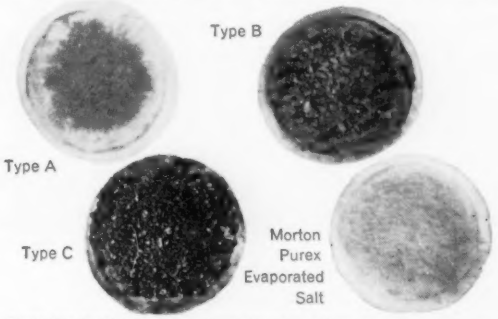
Brine tanks never need cleaning out when you use sludge-free Purex Salt

Yes, we mean never! You prevent costly shutdowns for maintenance. You save time and completely eliminate labor costs for cleaning out brine tanks. For Morton Purex Salt is 100% soluble. It will leave no accumulation of sludge—shale and sulphates—in either your brine or water-softening system.

What's more, none of your purchase price or freight bill for Purex goes toward paying for insolubles. This is an important saving, for in every 100 lbs. of ordinary salt you buy, you assume the risk of paying for up to 5 lbs. of shale and sulphates. In a 50-ton carload of ordinary salt, you may pay for as much as 5,000 lbs. of sludge. And you buy salt with "built-in" maintenance problems.

With sludge-free Morton Purex Salt, you get high-purity evaporated salt made in a controlled-particle size to prevent packing and channeling. Purex can be used in bulk wet storage systems and in the Morton Model E Brinemaker.

These filter pads (approximately 1/6 actual size) show you how much insoluble matter (sludge) you get in just 5 lbs. of various types of salt



Tests for insolubles taken from these random samples show you that Morton Purex is the only one that contains no wasteful sludge or insolubles.

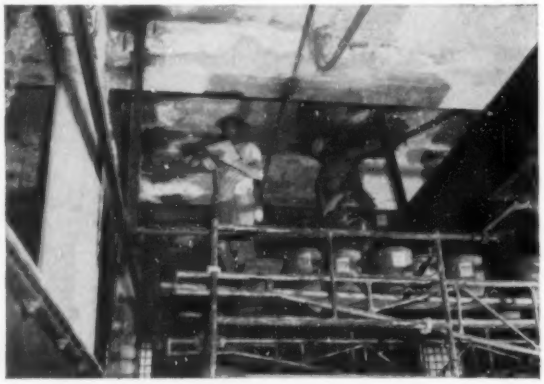
For more information about Morton Purex Salt and for free, expert help on any water-softening or brine-making problem, write or wire:

MORTON SALT COMPANY
INDUSTRIAL DIVISION
Dept. PW 7-58, 110 N. Wacker Drive
Chicago 6, Illinois

How THORITE and THOROSEAL made this underground structure sound again!

Workmen prepare old surface for patching with THORITE.

Water has entered the concrete and caused corrosion of reinforcing rods, blistering the concrete off surface and causing structural weakness throughout building.



Reinforcing was cleaned, all corrosion was removed and brush coat of THORITE applied over entire patching area, then filled in with trowel coats of THORITE, even with surrounding surfaces.

THORITE Patching Mortar sets in 20 to 30 minutes and can be coated with THOROSEAL while hardening.

"How to do it" GET OUR 16 PAGE BROCHURE

STANDARD DRY WALL PRODUCTS, INC.
NEW EAGLE, PENNA. CENTERVILLE, IND.

PUBLIC WORKS

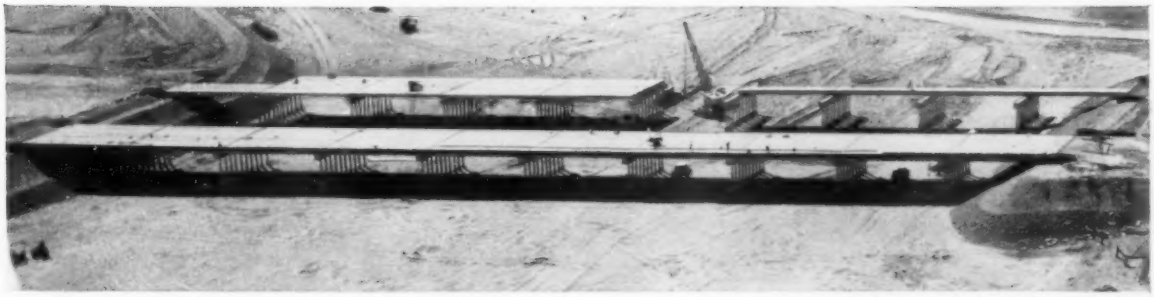
Leader in Public Works

Robert S. Hopson is the 13th Director of Public Works that Richmond, Va., has had in the 130 years since Richard Young was appointed in 1828 to serve the then population of about 16,000. Mr. Hopson entered the service of the City in 1946 as Chief of the Division of Street Cleaning, becoming Chief of Operations of the Department of Public Works in 1951 and Director of Public Works in 1954. His Department includes three major Bureaus — Business Management, Engineering and Operations. In addition to city-wide engineering and housekeeping activities, the Department operates an excellent airport and a fine inland harbor. Thus it has responsibility for land, sea and air activities.

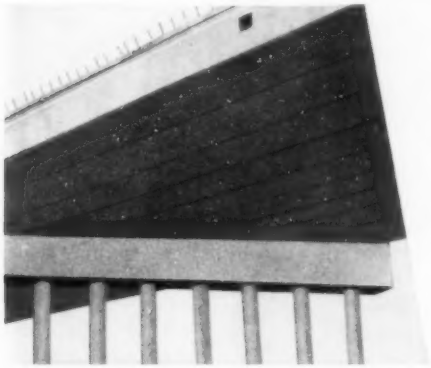
During his period of service to Richmond he has guided development of the "task force" system of refuse collection, installed the land fill method of refuse disposal and streamlined the organizational structure of the Public Works Department.

Mr. Hopson, a native of Illinois, was graduated from the University of Illinois in 1937 with a BS degree; in 1943 Loyola awarded him the degree of MS in Public Health. He was a commissioned officer in the Public Health Service during the war period, and was stationed in Richmond from 1943 to 1946. In 1937 he married Irene Allen and they have two children, Barbara and Craig. One of Mr. Hopson's special hobbies is salt water fishing, which he terms THE best, in the tributaries of Chesapeake Bay. He is a member of the APHA and the Virginia Public Health Association; a Regional Director of the American Public Works Association and President of the DC-Maryland Chapter APWA.

AMDEK Bridge Beams
speed superhighway construction



Dual lane highway bridges, constructed with prestressed pretensioned Amdek Beams, near completion in Socorro County, New Mexico. Erected for the New Mexico State Highway Department as part of the Federal Interstate Program.



Low depth-to-span ratio means less weight, greater clearance and reduced fill. Smooth underdeck offers minimum resistance to flood debris.

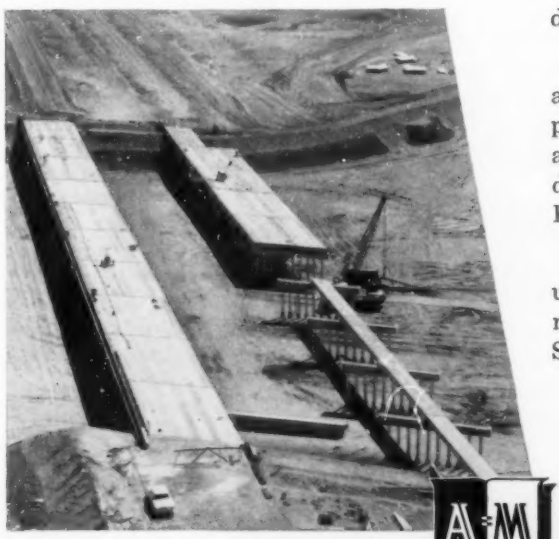
Another example of

Progress in Concrete

Amdek Superstructures—available in lengths up to 100 feet or even more—can cut bridge building time from weeks to days or days to hours! Prestressed, pretensioned, and with specially designed voids, Amdek Sections are lighter and more rigid for better, easier handling . . . provide a stronger combination deck and loading member.

Precast Amdek is rapidly placed in any weather and assures a bridge of beauty for years without painting or other maintenance. Materials are readily available . . . plants are strategically located for fast delivery anywhere—to bring you "Tomorrow's Bridge" today.

American-Marietta's experts in the design and manufacture of prestressed and precast concrete bridge members—including Amdek, I-Beams and Channel Slabs—can help *you* save considerable time and money.



200 Amdek Box Girders used to build 506 foot bridges on 30° skew. Independent dynamic and static load tests prove superior strength of Amdek Skew Beams.

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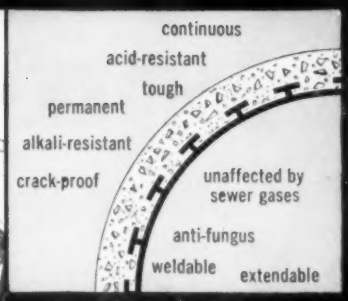
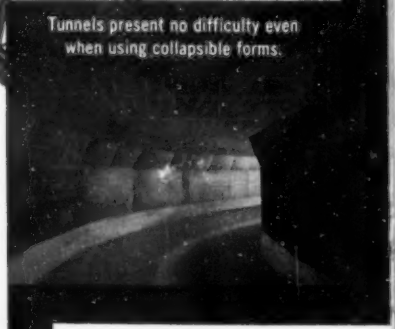
CONCRETE PRODUCTS DIVISION
GENERAL OFFICES:
AMERICAN-MARIETTA BUILDING
101 EAST ONTARIO STREET, CHICAGO 11, ILLINOIS, PHONE: WHITEHALL 4-5600

T-lock® sewer lining prevents hydrogen sulfide attack...



Tunnels present no difficulty even when using collapsible forms.



MILLIONS OF SQUARE FEET NOW IN USE! T-Lock Amer-Plate permanently ends corrosion in concrete sewer systems—because it is impervious to hydrogen sulfide, other sewer gases, fungus, bacteria, acids, alkalies and salts.

T-Lock is an extremely dense, flexible, crack-proof liner of high polymer vinyl resin. Integral T-shaped ribs are permanently locked into concrete during pouring. Joints are heat-fused to form a continuous protective lining that will not separate from the concrete even under extreme back pressure.

Over 3 million square feet of T-Lock Amer-Plate have been installed in pre-cast, cast-in-place and monolithic sewer structures of all sizes with no sacrifice of structural strength — at costs comparable to earlier lining methods.

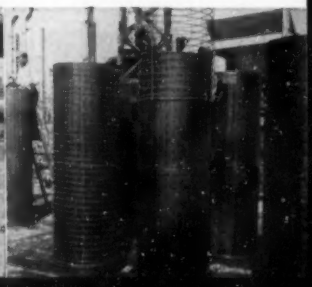
Illustrated brochure and list of typical installations on request.

Houston, Tex.
Jacksonville, Fla.
Kenilworth, N.J.
Evanston, Ill

Amercoat® CORPORATION, Dept. BG
4809 Firestone Blvd., South Gate, Calif.

Readily adaptable to complex forms for cast-in-place structures.

T-Lock in place on inner form before pipe is poured.



LEFT: A typical section of pavement to be treated with Bitumuls Slurry Seal in Rochester.
RIGHT: The same pavement section after treatment with Bitumuls Slurry Seal. (Note how the crack in the foreground has been sealed).

BITUMULS SLURRY SEALS ARE REAL LIFE SAVERS*

For Pavements in Rochester, New York

*By permission of Beech-Nut Life Savers, Inc., for candies

The City of Rochester, New York, was faced with a problem common to many communities today: keep all streets maintained in serviceable condition; yet do it at a cost that will permit the complete replacement (out of Maintenance Department funds) of many miles of streets that are over-aged.

Problem: How can you keep overall maintenance costs low enough to permit planned replacement of certain streets?

Answer: Bitumuls Slurry Sealing . . . a "life saving" technique for keeping distressed pavements in "good working order". Streets that were badly oxidized, cracked and open-textured due to a combination of age, heavy traffic, and winter weather were readily rejuvenated by the sealing, crack-filling and void-filling properties of Bitumuls® emulsified asphalt slurry.

Bitumuls Slurry Seals actually provided a holding action against wear and weather at extremely low cost. Savings over former methods were pronounced because very-costly winter patching of chuck-holes was completely eliminated. As a result, expenditures for repair and control of winter damage were **reduced by almost seventy percent!**

The money thus saved was diverted to reconstruction of streets that were beyond maintenance or repair.

Bitumuls Slurry Sealing is normally . . . and should be . . . regarded as only a **temporary treatment** for distressed pavements. Adequate repairs or pavement-replacement must eventually be made. Yet it is truly a "Life Saver", since it seals, protects and preserves any basically sound pavement against further deterioration until such a time as major repairs can be made, or the pavement can be replaced.

Typical view of the high-speed, high-efficiency Bitumuls Slurry Sealing in Rochester.

Your community, too, can benefit from the use of Bitumuls Slurry Seals. For further information on Slurry Sealing . . . or for the complete Bitumuls/Life Saver story . . . call our nearest office.

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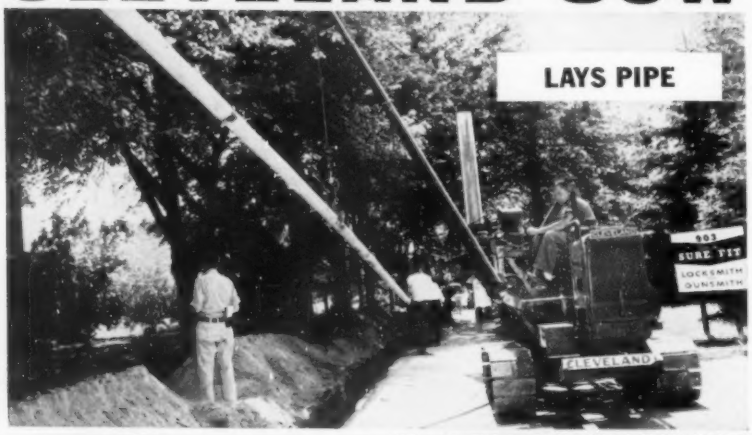
CLEVELAND 80W



Does all three jobs better—with only one operator

Lays pipe • 30,000 foot-pound capacity—power boom, up and down • 4 line speeds • long reach, 21 feet • sets hydrants, valves • unloads, strings • pulls street crossings • handles headache ball.

Backfills fast—from either side of trench • 20 passes per minute • 4½ foot scraper board • backfills clean • stays off completed work • works safer, parallels work • fits all job conditions.

Tamps as it fills • meets rigid density specifications • tamps from the bottom up • parallels work, no straddling • tamps wider, tamps safer • breaks concrete • reduces haul-out • saves clean-up.

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere

CLEANING CURVED SEWERS

With the advent of flexible steel jointed rods, the use of curvilinear sewers has become quite common in California where I live and have observed changes in practices during the last forty years.

The City of Los Angeles has for the last 22 years, and possibly longer, been laying curved sewers to a 100-ft. minimum radius on sewers 8 to 27 inches in size. Manhole spacings are 350 feet for 8-in. to 15-in. and longer for larger sizes. The City of Los Angeles uses 90 percent 8 and 10-inch pipe sizes in present construction.

In the cleaning operations the department reports no apparent difficulty is experienced on curved lines, whether horizontal or vertical, using flexible steel rods, hydraulic or bucket machines for cleaning purposes.

It has been the writer's observation that some of the more mountainous sections use 90° curves on storm drains. In such instances, where the gradient is steep, the catch basins may be on the left side of the street, immediately above the pipe line and a 90° curve is made to the right side of the cross street. This may continue for only one block where a similar curve is made to the right, which would locate the catch basins and pipe again on the left side of the street to accommodate the gradient of the terrain.

In such instances, man-holes are placed at the center of the 90° elbow and such lines are 24-inch minimum. When these lines become clogged with sand and gravel, during very heavy rainfalls, our experience is that no more cleaning time, or possible damage to the drain is experienced, where manholes are so spaced. It is claimed that these curved drains have better velocity than straight lines, and that debris is then carried to lower and larger drains on level streets where cleaning is more easily accomplished. Where such 90° curves are made,

In Baltimore . . .

MONOTUBE POLES for the giant Harbor Tunnel Expressway Project

For exceptional appearance, design choice, maximum life and maintenance economy, specify Union Metal MONOTUBE lighting poles.

Steel or aluminum . . . round or fluted . . . davit or bracket type design . . . anchor or transformer base . . . Union Metal's half-century of experience is your guarantee of complete satisfaction.

Catalog information is readily available. Write The Union Metal Manufacturing Company, Canton 5, Ohio. In Canada: The Union Metal Manufacturing Company of Canada Limited, Brampton, Ontario.

UNION METAL

Monotube Lighting Poles

Modern Monotube davit lighting poles and overhead sign supports help speed traffic and reduce accidents along Baltimore's new 17 mile—130 million dollar expressway system.

LIVE BETTER ELECTRICALLY

300,000,000 Feet in Service Today!

ORANGEBURG®

Root-Proof PIPE AND FITTINGS

Over 300,000,000 feet of Orangeburg Pipe are in service today from Maine to California. Its recorded use in sewage disposal work dates back to 1906.

Orangeburg's root-proof joints and its resistance to corrosion make the pipe particularly adaptable for house sewers and other underground non-pressure uses outside the home.

Through its record in actual service, Orangeburg has gained acceptance by leading approving authorities, architects, engineers, plumbers and builders.

Outstanding quality is the big reason. Orangeburg is strong, tough, resilient... withstands traffic tensions... temperature changes. Resists acids and alkalies in ground waters and sewage wastes... lasts for years underground.

Orangeburg makes quick work of installation. Long light lengths are easy to handle. Taperweld Joints seal root-proof without cement or compounds.

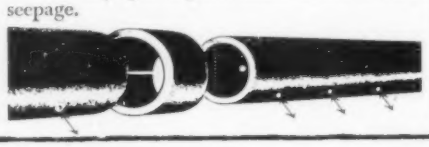
Write Dept. PW-78 for Engineers' independent report on Orangeburg Sewer Pipe.

Orangeburg Manufacturing Co., Inc.
Orangeburg, N. Y. Newark, Calif.

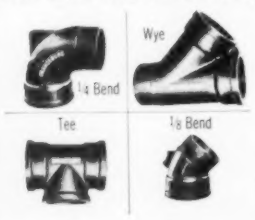
ORANGEBURG

Also Comes Perforated

for foundation drains, septic tank disposal fields, subsurface drainage of lawns, fields, wet-spots everywhere. Snap couplings keep pipe in line. Scientifically spaced perforations assure uniform seepage.



THESE EXCLUSIVE ORANGEBURG FITTINGS SIMPLIFY INSTALLATION



the writer, if supervising the laying of the pipe, would suggest that it would be a good precaution to cement the wide space inside of the cocked pipe, but this is probably common practice. Such an uncemented inside joint, might tend to catch a lead tool on a string of flexible steel rods and retard forward movement.

H. R. Crane,
Flexible, Inc.,
Los Angeles, Calif.

Editor's Note: Following a request from the Building Research Advisory Board in regard to the use of curved sewers, as in curvilinear streets in residential areas, we wrote Mr. Crane for his experiences in cleaning, since this would be an important factor in curved sewer line acceptance.

COUNTY-WIDE REFUSE DISPOSAL

Joseph Hunt, Vector Control Specialist of the Public Health Service, has been assigned to the Umatilla County area, of which Pendleton is the largest city. In the short time that Mr. Hunt has been here, he has made a study of existing refuse collection and disposal practices throughout the county and has been working closely with city and county officials to correct their practices where correction is needed.

In Pendleton itself, Mr. Hunt's recommendation is the adoption of a new garbage and refuse ordinance and proper enforcement of that ordinance as a first step; and then the closing of the present open dump and a change to a sanitary land fill operation.

In some of the areas of the county where there are a number of small cities (less than 1000 population each) he has made some progress in working out a single collection and disposal system to serve several cities. Presently, it looks as if the first sanitary landfill in Oregon may be started in such an area.

Gerald W. Ulett,
City Engineer,
Pendleton, Ore.

• • •

Resurfacing Program For Ohio

Ohio disclosed 1958 plans for a new statewide highway resurfacing program that will bring to over $35 million the amount spent for this type of work since the spring of 1957. The 1958 program will cost more than $15 million. About half this money will be financed from funds just allocated Ohio as its share of the federal government's emergency highway program. The other half is strictly Ohio money.

NEW POWER... NEW DESIGN!

NEW! LOWER PRICE
the '58 Ottawa MODEL LX BACKHOE
digs 12½ ft. deep in any position of 190° continuous swing

NEW! A-FRAME DESIGN insures a solid foundation for smooth performance even when the going is rough! Levels up to 10° on hillsides. ANGLE-POISED OUTRIGGERS give rigid bracing for digging and loading at any angle up to 95° right or left from the centerline of tractor!

NEW! 7000 POUNDS OF "BIG MUSCLE" POWER at point-of-bite moves more yardage, faster!

NEW! BUILT-IN DEPENDABILITY results from reverse-mounted bucket and crowd cylinders which place the highly polished rods up and away from rocks and dirt and do away with exposed hydraulic lines and hoses. The "big muscle" doesn't know what "down time" is!

Completely maneuverable, the Ottawa Model LX MOUNTS ON MANY TRACTORS . . . digs 12½ feet deep in any position of 190° continuous swing . . . features exclusive "One Trols," automatic dirt-ejector buckets . . . turret-type seat that pivots with boom.

NEW! Ottawa Model U LOADER teams up with backhoe for faster, more powerful and efficient delivery of the pay load! From ground to 8 ft. dumping height in 4½ seconds . . . dumps in 2 seconds . . . down in 3 seconds . . . 2400 lbs. of "Big Muscle" lifting capacity, 3500 lbs. breakout. Write for folder today!

GET FULL, *FREE* INFORMATION!
WRITE TODAY . . .

Ottawa Steel Division,
Young Spring & Wire Corporation,
Ottawa, Kansas

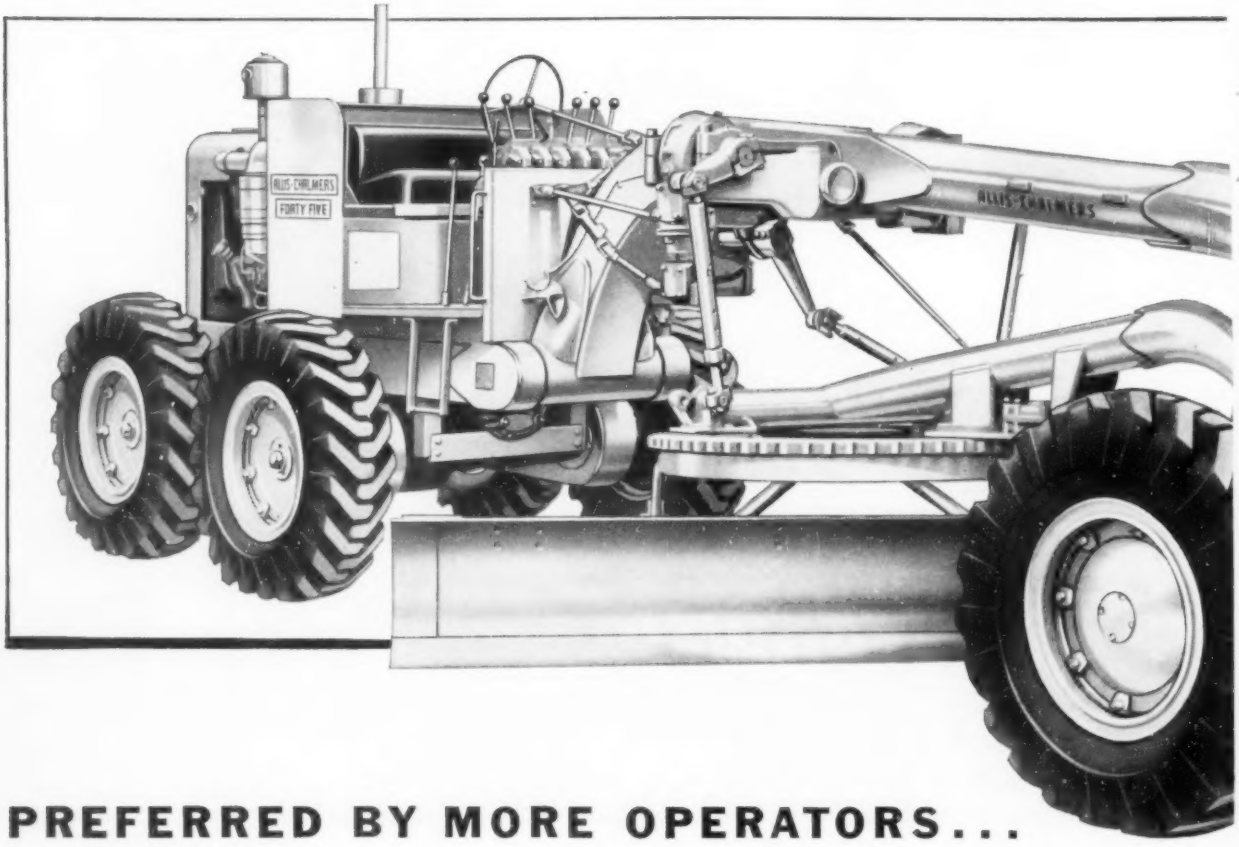
Please send complete illustrated information on the new 1958 line of Ottawa Backhoes and Loaders for _____ tractors, to:

NAME _____ FIRM _____

ADDRESS _____ CITY & STATE _____

OTTAWA "BIG MUSCLE" BACKHOE
and FRONT-END-LOADER

For consistently tough jobs, compare with any other heavy-duty motor grader



PREFERRED BY MORE OPERATORS... BOUGHT BY MORE USERS EVERY DAY

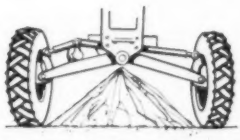
The FORTY FIVE has the power, weight, traction and speeds you need for high-production grading. Superior stability and precision control give you deep precision cuts or smooth finishes. The FORTY FIVE is built to take the shocks and strains of heavy-duty service — and to keep production steady. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

Look ahead... *move ahead* ...and stay ahead with **ALLIS-CHALMERS**

Allis-Chalmers FORTY FIVE performance

- 120 brake hp
- 6 forward speeds to 20.6 mph
- 3 reverse speeds to 7.0 mph
- 23,800 lb approx.

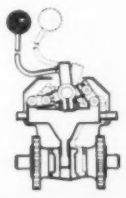
Advantages that mean more production . . . less maintenance . . . easier and better operation



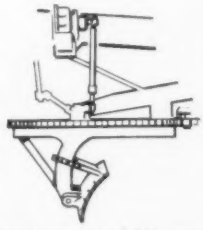
Extra high axle and throat clearance means bigger loads at the blade.

The ROLL-AWAY moldboard rolls dirt, gives more performance per horsepower, more production per gallon.

Fully enclosed power steering — easy control under all conditions.



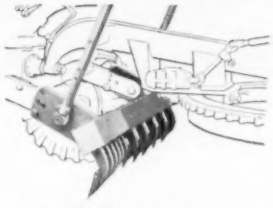
Toggle-type controls are exclusive with Allis-Chalmers.



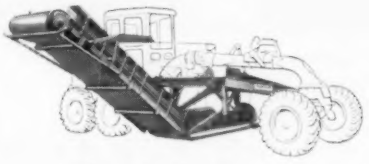
Front-mounted lift cases eliminate long shafts that twist under loads.

Matched attachments and accessories make it a year-round producer

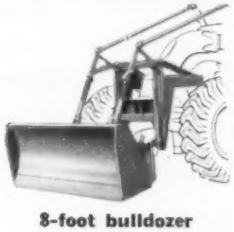
All-steel, stand-up cab



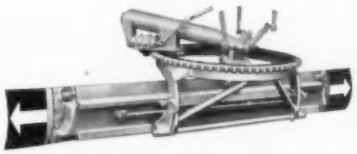
11-tooth, V-type scarifier



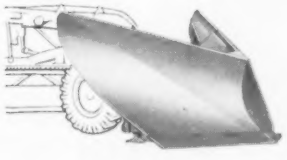
Hancock elevator



8-foot bulldozer



Hydraulic, shiftable moldboard

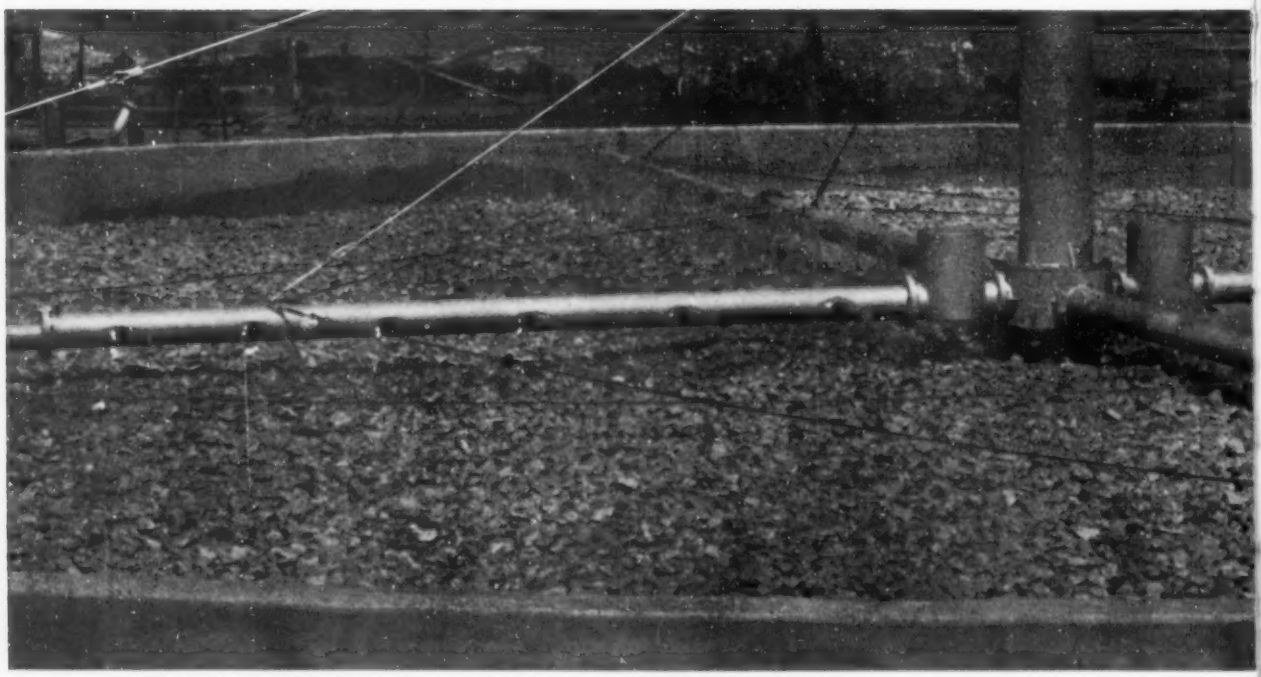


V-type snowplow

ROLL-AWAY is an Allis-Chalmers trademark.

low cost and high efficiency highlight

with



Greenville, Texas, filter. Engineers, Freese and Nichols, Fort Worth. Contractors, Travis and Miller. Ralph B. Carter Co. Distributor.

SPECIFICATIONS

ASTM specifications insure good trickling filter underdrains — insure that you get the best. TFFI members supply vitrified clay blocks that exceed ASTM requirements. Ask any member for a copy of approved Specifications ASTM C-159-55.

MODERN PLANTS

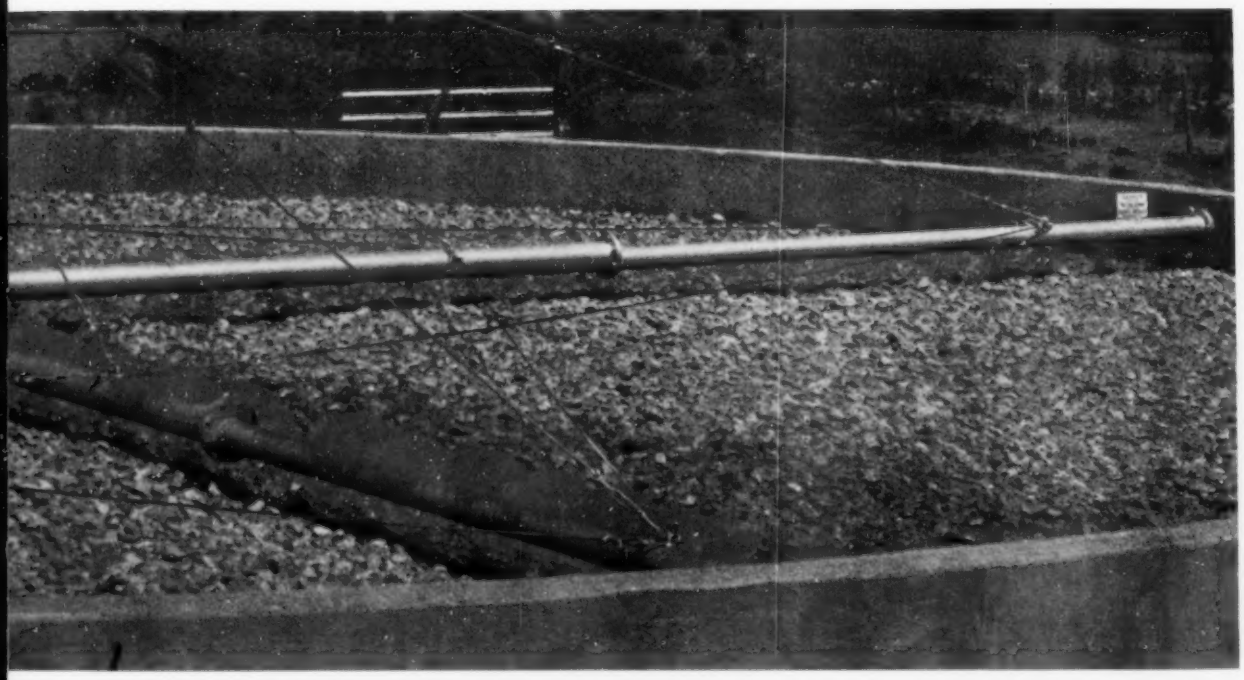
Vitrified clay blocks are superior because they are made in modern plants under rigid controls usually impossible with substitutes.

trickling filters

TFFI specification
vitrified
clay bottom blocks

LOW COST For your next sewage treatment plant use Trickling Filters with vitrified clay underdrains. Remember, Trickling Filters have many advantages, starting with low first cost, followed by low operating costs. Others are: simplicity of operation, very long useful life, flexibility, excellent results, top-notch effluent, overloads no problem.

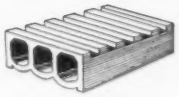
PERMANENCE Since a Trickling Filter can be no better than its underdrain system, it is vital that the floor blocks be of vitrified clay. They guarantee permanence with protection against acids, alkalis and bacterial action that blocks made from a substitute material cannot possibly give. Ask any member below about our 50-year guarantee of vitrified clay underdrain blocks.



ARMCRE
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.

DICKEY
W. S. Dickey Clay Mfg. Co.
Kansas City 6, Mo.

NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.



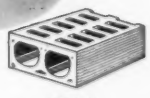
TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas

TFFI
Symbol of good treatment

TRICKLING FILTER FLOOR INSTITUTE

POMONA
Pomona Terra-Cotta Co.
Greensboro, No. Car.

TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.



BOSCO
Bowerston Shale Co.
Bowerston, Ohio

ADDRESS ANY MEMBER OF THE INSTITUTE FOR FULL DETAILS AND SUGGESTED SPECIFICATIONS FOR BLOCKS

"Our Ford Tandems outlast

Says David Courtney, President
Courtney and Plummer, Inc., Neenah, Wis.

"We've got '49 model Fords with over 400,000 hard miles on 'em . . . and they're still going strong!

"Our Ford tandem dump trucks carry 8 yards of gravel and average about 50,000 miles per year. We've never had such good engine life, as with these Ford Heavy Duty V-8's.

"We started using Ford trucks with a model 'A' for dump service in 1930, and bought our first Ford heavy-duty job in 1949. After 125,000 miles of outstanding performance this F-8 was still running real good, so we added more Fords to our fleet. They keep working, year after year, with a minimum amount of upkeep . . . and that's really something in this business.

"With the addition of our four new '58s, we now have fifty-five Ford trucks and are very satisfied. And we like the fine service we get from our Ford Dealer. They always keep a complete stock of parts, so we don't have to carry any, and they stand behind what they sell 100%.

"I guess the best proof of how Ford trucks perform is the fact *we keep on buying more!* We just took delivery on a T-850 Extra Heavy with Super Duty V-8, and have several more on order for our transit-mix business."

Official registrations show ***AMERICAN BUSINESS BUYS MORE FORD TRUCKS THAN ANY OTHER MAKE!***

anything we've ever owned"

Taking big loads and all roads in stride, these Ford T-800 tandem dumps have built an outstanding reputation for performance and durability. Shown loaded with 8 yards of gravel, they daily deliver and dump tons of sand or gravel.

New '58 T-850 with 401-cu. in. Super Duty V-8 and front-end power take-off mixer drive . . . handles 6-yard loads legally.

Bring extra savings to your business . . . make your next truck a FORD!

Official registrations for 1957 show that *American business buys more Ford trucks than any other make.* There are many reasons for this popularity . . . many reasons for *you* to make your next truck a Ford!

Ford trucks are your best buy! Ford's initial costs are *low* and resale value is traditionally high. The modern Ford Styleside pickups are the lowest-priced models available with full cab-wide body . . . giving you 23% more loadspace than any traditional type pickup box.

Only Ford offers the economy of Short Stroke power in all engines, Six or V-8. And Ford's Heavy Duty V-8's offer new, advanced durability features. The modern Ford Six, available in Light and Medium Duty F- and P-Series trucks, has a new carburetor that gives you up to 10% greater gas mileage. It's plenty peppy, too, with more horsepower per cubic inch than any other six in its class.

Ford's rugged cab and chassis construction means these new '58s are built to last. Every Ford has safety glass in every window. All this plus the proven fact that Ford trucks last longer adds up to America's No. 1 truck value. See your local Ford Dealer for the latest in '58 trucks or the best in A-1 used trucks.

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

Sanitary landfill saves Ohio

Caterpillar No. 933 Traxcavator handles efficient, economical disposal operation with ease and is available for other work assignments around the city

The City of Wyoming, Ohio, estimates an annual saving of at least $20,000 from its new sanitary landfill operation. To the community of 7,500 this means $5,000 for more police protection, $2,500 for a tree spray program, $7,500 for street repair and construction, and $5,000 to increase salaries of city employees.

Where did this saving come from? By eliminating the need to keep nonburnable refuse separate, the number of collection trucks was cut from 5 to 2 with no reduction in service. And incinerator operation and repair no longer are budget items.

The key to the success of any sanitary landfill operation is the machine that does the work. That's why municipalities throughout the country are depending on a Caterpillar No. 933 Traxcavator for top performance.

The No. 933 has the power, flotation and ease of operation that make it ideal for a sanitary landfill.

Wyoming City Manager R. D. Anderegg, left, checks sanitary landfill operation figures with Jack Collins, Director of Public Works.

And it can handle many other municipal jobs, too. Excavation, fills, snow removal—a Traxcavator can do anything a tractor can—and then some!

The No. 933's features include 40-degree tilt-back of the bucket at ground level to assure full loads at every pass, one-hand bucket and lift controls for quick, easy operation, and balanced unit design that means faster cycle time.

There are three Traxcavators in the Caterpillar line—the No. 933 (50 HP, 1 cu. yd. bucket capacity), No. 955 (70 HP, 1½ cu. yd.) and No. 977 (100 HP, 2¼ cu. yd.). The new Side Dump Bucket now is available on all three.

Your nearby Caterpillar Dealer will give you the facts on sanitary landfill and how these big, yellow machines give the most value for your taxpayers' dollars. And you can depend on him for good, prompt service and parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

community $20,000 a year

Until switching to a sanitary landfill, Wyoming was using an incinerator with a daily capacity of only 5 tons. By Tuesday each week it was necessary to burn in the open. Now a Cat No. 933 Traxcavator, pictured at work above, handles the disposal operation easily, and is available for other municipal work. City Manager R. D. Anderegg says no additional equipment will be needed until the population reaches 12,000.

Here are the reasons why the City of Wyoming switched to this modern method of disposal. Aren't they reasons that make sense to your taxpayers?

- Sanitary landfill eliminates fire and odor nuisances, and flies, mosquitoes, rats and other disease-carrying vermin.
- Combined garbage and refuse collection cuts costs by eliminating sorting.
- Costs considerably less than incineration, the next most satisfactory method of disposal.
- Disposal sites can be closer to community without creating a nuisance.
- Waste or useless land can be reclaimed and converted into parks or recreation areas. This boosts surrounding property value.
- Minimum of equipment required, and it can be used for other city work.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

YOUR TAXPAYERS GET THEIR MONEY'S WORTH WITH CAT-BUILT MACHINES

EQUIPMENT and MATERIALS

FOR YOUR

PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Renew Pipe Performance With Cement Mortar Lining

322. Application of the Tate and Spunline process for cement mortar lining of existing pipe lines with a minimum of interruption of service is described, with diagrams, photographs and specifications in Catalog 15-58. Write to Pipe Linings, Div. of American Pipe and Construction Co., P. O. Box 457, Wilmington, Calif., or check the reply card.

Sanitary Landfill—Answer To a Community Problem

348. This package of materials is designed to help interested communities and group plan and operate a sanitary landfill program. Different methods of refuse cover are discussed, as well as what type of collecting, compacting and excavating equipment is best for each type of landfill. Check the reply card or write to Caterpillar Tractor Co., Dept. NS, Advertising Div., Peoria, Ill., today.

Manual on Steel Bridge Design For Modern Highways

344. This 32-page Manual is designed as an aid in structural steel bridge design and is divided into 2 sections. The first discusses the economy of steel, welding, erection, steel decking and composite design. The second part is devoted to examples of selected details showing solutions that have been used in steel bridge design. Check the reply card or write American Institute of Steel Construction, 101 Park Ave., New York 17, N. Y., for your copy.

Self-Propelled Concrete Saws

339. Literature on self-propelled concrete saws is available from Champion Mfg. Co., 2028 Washington Ave., St. Louis 3, Mo. Also included are details on silicon carbide and diamond blades. Check the reply card.

3-5 Ton Tandem Roller

341. Huber-Warco 3-5 ton tandem roller is designed for smaller rolling operations such as parking lots and driveways. Check the reply card or write Huber-Warco Co., Marion, Ohio, for Bulletin HWT 536 that gives complete information on this roller.

Valuable Data on Oliver OC-18 Diesel Crawler

342. Specifications, operation and maintenance data and optional equipment are covered in bulletin from The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 17, Ohio. Check the reply card for full details.

Waste Receptacle Designed For Efficient and Economical Sanitation

345. This waste receptacle is readily attached to any post or wall and can be used in streets, parks and public buildings. Check the reply card or write Vega Industries, Inc., Syracuse 5, N. Y., for complete literature.

Wire and Strand For Prestressed Concrete

346. Pre-tensioned and post-tensioned prestressed concrete are described in literature from Union Wire Rope Corp., 21st and Manchester Ave., Kansas City 26, Mo. Use of wire and strand for prestressed concrete is covered and a price schedule is included. Check the reply card.

Precast, Prestressed, Pretensioned Concrete Bridges

349. Colorful bulletin, well illustrated, shows the manufacture of Amdek prestressed bridge members. Check the reply card for this helpful bulletin or write Concrete Products Div., American Marietta Co., 101 East Ontario St., Chicago 11, Ill.

Data on the Standard Rate Recorder For Water Meters

351. The Dual Pen Model Meter-Master is light and compact, takes 3 mins. to hook-up and converts any standard meter to a demand meter. Check the reply card or write F. S. Brainard & Co., 246 Palm St., Hartford 12, Conn., for chart speeds and operation.

How To Plan, Layout and Install Underground Sprinkler System

355. An authoritative, fact-filled bulletin that tells with pictures the steps to take in installing the Rain Jet underground sprinkler system is available from Rain Jet Corp., 301 South Flower St., Burbank, Calif. Check the reply card for this valuable bulletin.

Aluminum Siding and Roofing For Buildings

357. Specifications on aluminum roofing and siding are included in 36-page catalog available from Aluminum Company of America, 1223 Alcoa Bldg., Pittsburgh 19, Pa. Check the reply card for installation and construction methods and typical details of these aluminum products.

Blacktop Spreader For Hough Tractor-Shovels

358. Blacktop spreader for hot or cold mix available for the Models HU, HH and HO Payloader tractor-shovels. Check the reply card or write Ram Equipment Co., Inc., 5209 W. Broadway, Minneapolis 22, Minn., for widths, capacity and other features.

Apparatus For Bituminous Concrete Testing

372. Sieves, extractors, balances, solvents and hot plates for testing bituminous concrete are described in literature from Will Corp., 39 Russell St., Rochester 3, N. Y.

Hand Operated Soil Sampling Kit

366. Bulletin 26-R describes the Acker soil sampling kit that contains 12 different soil sampling tools packed in a handy steel case. Check the reply card or write to Acker Drill Co., Inc., Scranton 2, Pa., for data on tools that are designed to take soil samples from practically any material.

Rear Wheel Power-Steer Tractor-Shovel

370. Complete specifications and illustrations of job applications of the 4-wheel drive Case W-9 Terraload'r are covered in Bulletin CTS-111 available from J. I. Case Co., Racine, Wis., or by checking the reply card.

Stoves For Roadside Parks and Picnic Areas

376. Hancock Parkmaster and Skeleton stoves for roadside parks and picnic areas are covered in literature from Hancock Iron Works, Pontiac, Mich. Check the reply card for data on unit sizes, cooking surface, mounting and weight.

Specs For Aluminum Increment Sheet Highway Traffic Signs

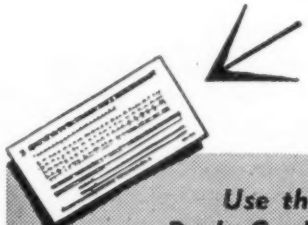
377. Installation procedures, bid specifications and general information on aluminum traffic signs are covered in Bulletin 58 R from Traffic and Street Sign Co., 84 Foundry St., Newark 5, N. J. Check the reply card for data on methods of erection, wind loadings and other details.

Automatic Bin Level Indicators For All Bulk Materials

378. Bin level indicators for municipal water treatment, asphalt batching plants, concrete batch plants and other installations where bins are used are described in 20-page catalog from the Bin-Dicator Co., 13946 Kercheval Ave., Detroit 15, Mich. Check the reply card.

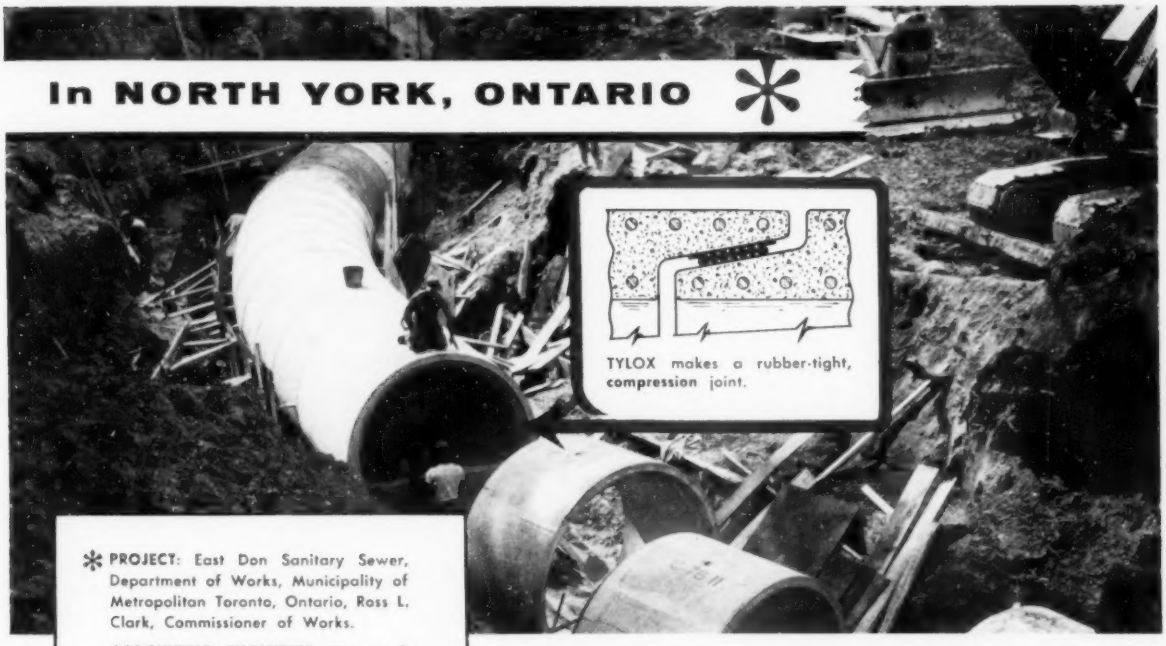
Receiver Recorder and Controller

381. Specification Catalog E12-5 contains details of newly developed plug-in components for the Bailey recorder. In all, 12 types of receivers, controllers, retransmitters, and direct measuring devices from which the recorder may be custom-built are described. Check the reply card or write Bailey Meter Co., 1050 Ivanhoe Road, Cleveland 10, Ohio.



Use the Reply Cards For Prompt Service

In NORTH YORK, ONTARIO *



* **PROJECT:** East Don Sanitary Sewer, Department of Works, Municipality of Metropolitan Toronto, Ontario, Ross L. Clark, Commissioner of Works.

CONSULTING ENGINEERS: Proctor & Redfern, Toronto, Canada.

CONTRACTOR: S. McNally & Sons Ltd., Hamilton and Toronto, Canada.

PIPE: 84" x 8' straight and radius reinforced concrete, Tylox-coupled pipe, manufactured by Niagara Concrete Pipe Ltd., St. Catherines, Ontario, Canada, a subsidiary of American Marietta Co.

TYLOX
Rubber GASKETS

REDUCE PIPE-LAYING COSTS . . . PREVENT JOINT LEAKS

In spite of narrow trenches and heavy 84" x 8' pipe, this trunk sewer at North York, Ontario is being laid as fast as the crane can lower the pipe. . . . This rapid progress is typical of the cost-saving speed of coupling pipe on *any* project where TYLOX Rubber Gaskets are used. *Flexible* TYLOX compensates for pipe angularities, permits coupling pipe in water or under water, and safely takes backfill loads immediately.

Even more important than the speed of coupling pipe with TYLOX, are the *watertight* joints assured. . . . TYLOX has seven sealing ribs which "pack" joints tight under compression, as shown in the diagram. Stresses from shifting soils or overburdens can't destroy the seal. Made of acid-resistant rubber, TYLOX never deteriorates. Under ground and under compression it *stays* watertight for the life of the pipe itself. Treatment plant loads are kept at a minimum and root and sediment problems are eliminated.

WRITE FOR TYLOX BROCHURE

containing engineering data and illustrated case histories. See for yourself why eight out of ten sanitary engineers specify TYLOX to assure fast construction of leakproof sewerage and drainage lines.

5106

HAMILTON KENT
MANUFACTURING COMPANY
KENT, OHIO
427 West Grant Street **Orchard 3-9555**

To order these helpful booklets check the reply card opposite page 34.

NEW LISTINGS (Cont.)

Manual on Construction Equipment

387. This 62-page Manual 600-8 covers compressors, sinker drills, demolition tools, diamond and wagon drills, diesel engines, vibrators, sump pumps and winches. Check the reply card or write Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y., for information on this equipment.

Cut Down Customer Complaints With the Chart-A-Meter

388. The Chart-A-Meter gives an accurate graphic record of water usage and fits on any water meter in place of the register. For complete data check the reply card or write H. E. Anderson Co., P. O. Box 1183, Muskogee, Okla., today.

Cast-Iron Pipe For House Service

401. Small diameter, 2-in. and 2½-in. cast-iron pipe in 150 and 250 psi classes available in bell and spigot and standardized mechanical joints, for building and house services and small water systems, is described in literature from Glamorgan Pipe and Foundry Co., Lynchburg, Va. Check the reply card.

Rent Cars and Trucks For Public Works Departments

412. Data are available from Avis Rent-a-Car System, Inc., 450 East 63rd St., New York 21, N. Y., on renting cars and trucks of all models and types. Check the reply card to find out how renting equipment can save maintenance and operation costs in the public works field.

Filter Sands and Under Drain Gravels

415. Filter sands and gravels for municipal water plants are described in literature available from Eau Claire Sand & Gravel Co., Eau Claire, Wis. Check the reply card for data on sizes available, silica content and content of magnesium, calcium carbonates and iron oxides.

Concrete Pressure Pipe for Conduits

404. Nomograms for bevel determination for curved alinement and for the design of concrete pipe to resist internal pressure and detailed information on cylinder and non-cylinder type vibro-cast pressure pipe with steel joint rings are contained in a 24-page manual. Check the reply card or write United Concrete Pipe Corp., P. O. Box 425, Baldwin Park, Calif.

How Control Valves Function

405. The operation of automatic valves is illustrated with simplified diagrams in an easy-to-understand 16-page bulletin. Applications cover throttling functions, pressure reduction, pressure relief, and check valve operation. Write for "Inside Clayton Automatic Valves" from Cla-Val Co., 17th and Placentia, Newport Beach, Calif., or check the reply card.

Walking Beam Flocculation Mechanism

416. Diagrams and photographs illustrating the application and installation of the Walking-Beam Flocer in sedimentation basins and sample specifications are included to aid the designing engineer in 16-page publication. Write the Stuart Corp., 516 N. Charles St., Baltimore 1, Md., or check the reply card.

General-Purpose Electronic Digital Computer

418. The Royal McBee LGP-30 is a small-size and reliable computing device that is mounted on casters and operates from 110-volt outlet. Check the reply card or write Royal McBee Corp., Westchester Ave., Port Chester, N. Y., for full details on this computer for the public works field.

Literature on Sand and Cinder Spreaders

423. Henderson spreaders have powerful conveyor drive, dependable distributor assembly, heavy-duty conveyor chain and spread from 8 to 32-ft. in width. Write Henderson Mfg. Co., Cedar Rapids, Ia., or check the reply card for information.

WATER WORKS

Equipment For Water, Sewage and Industrial Waste Treatment

24. The complete line of Jeffrey equipment for treatment plants is covered in a 66-page Catalog 905 available from The Jeffrey Mfg. Co., Columbus 16, Ohio. Check the reply card for information on bar and disc type screens, traveling water screens, grinders, grit collectors, garbage grinders, sludge, draw-off valves, chemical feeders, bucket elevators and scum removers to mention some of the equipment.

Ball and Socket River Crossing Cast Iron Pipe

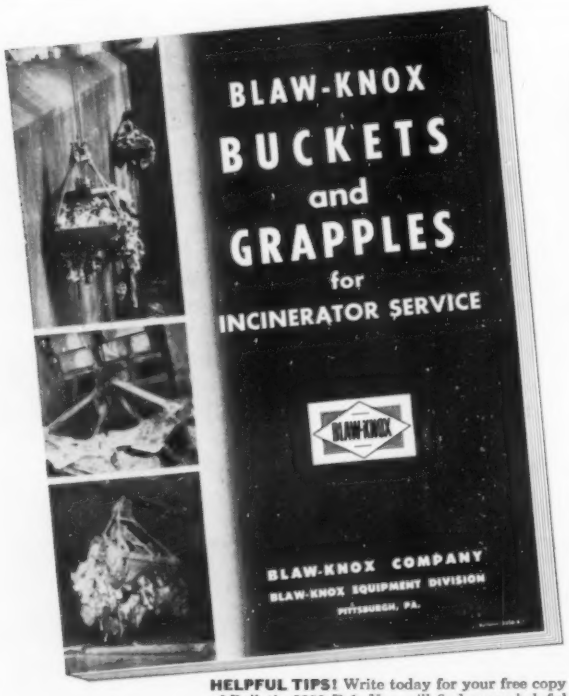
33. Literature is available describing Clow ball and socket cast iron pipe for river crossing, or any installation where full 15 degree free turning deflection is desirable. For full description and specifications, address James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill., or check the reply card.

Plastic Wash Troughs For Water Treatment

45. Leopold fiberglass-reinforced plastic wash troughs for water treatment are described in literature from F. B. Leopold Co., Zelienople, Pa. Check the reply card for data on these units that will last for years without any painting or other maintenance.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American Water meters described in Bulletin No. 56 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Check the reply card.



HELPFUL TIPS! Write today for your free copy of Bulletin 2350 R-1. You will find many helpful answers to design and operating problems from the standpoint of efficient handling practice.

BLAW-KNOX

NEW!

for municipal and design engineers

Here is the latest information to assist you in the planning, construction and operation of modern municipal incinerators.

Blaw-Knox Bulletin 2350 R-1 offers tested, proved answers to important questions in the handling of refuse as it applies to good incinerator operating practice.

TYPICAL SPECIFICATIONS

To help guide you in selecting the proper clamshell bucket or tine-type grapple for incinerator service, Blaw-Knox Bucket Engineers have prepared typical detailed specifications.

BLAW-KNOX COMPANY

Blaw-Knox Equipment Division
Pittsburgh 38, Pennsylvania

WILL YOUR NEXT WATER TANK GIVE YOUR COMMUNITY THESE PROTECTIVE ASSURANCES?

. . . It will, if it is CB&I-BUILT . . . of welded STEEL construction.

It's easy to take steel for granted. Evidence of its workability and durability can be seen anywhere, anytime, any place. But its *particular* dependability as a material of construction for water storage structures reaches beyond the commonplace.

Here is why *CB&I* uses steel; why most *consulting engineers* specify steel; and why more water for municipalities is *stored* in steel than in any other material of construction:

CB&I STEEL TANKS are built to AWWA Specifications—To a factor of safety established by the collective experience of the best engineering knowledge available on the subject of water storage.

CB&I STEEL TANKS ARE "Tight"—A fact that is accepted without question even *before* the structure is fabricated and erected.

CB&I STEEL TANKS are flexible—to provide only specified *known* amounts of differential settlement, which do not affect the utility or safety of the structure.

CB&I STEEL TANKS are stable structures. There is no loss in effective strength of material with the passage of time.

CB&I-BUILT STEEL TANKS are the *responsibility* of CB&I through all phases of design, fabrication and erection. Almost 70 years of engineered *craftsmanship in steel* back every structure. This is your assurance of predictable maintenance costs and long service life.

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Above: A 2,500,000-gal. Hortonspheroidal elevated tank blends attractively with landscape at Cincinnati, Ohio.

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Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, GREENVILLE, PA. and at NEW CASTLE, DELAWARE.

To order these helpful booklets check the reply card opposite page 34.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH, Chlorine and Phosphate Control and descriptions of comparators for making colorimetric analyses. A 100 page booklet is available by checking reply card. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Automatic Valveless Filter

127. Bulletin describes fully the operation of the Permutit automatic valveless filter. The filter can be used wherever gravity flow is feasible. Check the reply card or write The Permutit Co., a Division of Pfaudler-Permutit, Inc., 50 West 44th St., New York 36, N. Y.

Submersible Electric Pumps For Dewatering Problems

167. Pumps range in size from 1½"-85 gpm capacity to 8"-300 gpm capacity, with head capacities up to 210 ft. Write to Stanco Mfg. & Sales Inc., 1666 Ninth St. (Corner of Olympic & Ninth), Santa Monica, Calif.

A Short Course In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the reply card.

Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp, Box 55-Station B, Buffalo 7, N. Y. Check the reply card for your information on these valve boxes.

Helpful Reference Catalog on Waterworks Gate Valves

146. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the reply card.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking reply card.

Accuracy In Chemical Proportioning

191. For chlorinating swimming pools or drinking water, for feeding polyphosphates, fluorides, soda ash, alum, or acids in water treatment where precise accuracy is required, consult the literature of Precision Chemical Pump Corp., 1396 Main St., Waltham 54, Mass.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the reply card or write to Chapman Valve Mfg. Co., Indian Orchard, Mass

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Manual on Pipe Finding Techniques

213. A manual on special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines. Check the reply card for your free copy.

Catalog on Dewatering Pumps

226. Centrifugal and diaphragm pumps for dewatering jobs are described in Catalog DP7 from The Jaeger Machine Co., 550 West Spring St., Columbus 16, O. Models, specifications and performance tables are included. Check the reply card.

Automatic Drilling Machine For Cutting Any Type of Pipe

325. The CL-12 drilling machine may be hand or power operated and will make cuts from 2 to 12 inches through any type of pipe. Check the reply card for full details or write the Mueller Co., Decatur, Ill.

Manual on the Hersey Disc Water Meter

329. Illustrations, descriptions and specifications of Hersey water meters are covered in manual available from Hersey Mfg. Co., 250 Elm St., Dedham, Mass. Size ranges are ⅝"-⅝"x¾"-¾" and 1". Check the reply card.

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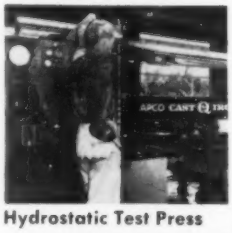
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To order these helpful booklets check the reply card opposite page 34.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. The larger model is available with air power unit to eliminate manual pushing. Get full details by checking the reply card. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Review of Diatomite Filtration of Water

285. A detailed review of the application of diatomite in the general field of water filtration, including uses in municipal supply and swimming pools is contained in a well-prepared 16-page bulletin. Specific applications to certain water treatment problems are also discussed. Write to the Dicalite Department, 612 So. Flower St., Los Angeles 17, Calif. for Bulletin BW-13 entitled, "Diatomite Filtration of Potable Water," or check the reply card.

Quick Review of Water Meters

316. A helpful condensed catalog which covers sizes and types of water meters for every kind of service is available from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. Each type is illustrated and fully described; specifications and prices are included. Get Bulletin W-800 by checking the reply card.

Morton Purex Salt For Water Plants

324. Sludge-free Morton Purex salt is described in literature from Morton Salt Co., Industrial Div., Dept. PW 6-58, 110 N. Wacker Drive, Chicago 6, Ill. Check the reply card for information on this 100 percent soluble salt.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa.

Testing Water Meters

353. This 40-page catalog is a discussion of fundamentals and a guide to sound practice in meter maintenance. It covers standard specifications of meter accuracy, descriptions of the latest developments in meter testing equipment and many drawings and diagrams. For your copy write The Ford Meter Box Co., Inc., Wabash, Indiana, or check the reply card.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Red Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Check the reply card.

Welded Steel Pipe from 6 to 10 3/4" Diameter

382. High grade butt welded light-weight steel pipe from 8 to 16-gauge in 20, 30 and 40-foot lengths, plain or asphalt coated, with choice of joints. Also available up to 0.188 wall. Check uses for municipal water lines, irrigation, well casings and many other applications. Self explanatory literature from Valley Mfg. Co., Valley, Nebraska.

What You Should Know About Hypochlorination

395. "Hypochlorination of Water" is the name of an informative publication issued by Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. In it there is a discussion of chlorination theory, practice and equipment; control of algae, tastes and odors; and laboratory testing.

Residual Chlorine Recorders For Water Plants and Swimming Pools

508. An instrument for measuring residual chlorine amperometrically in a continuous sample and recording the reading in parts per million on a 24 hour circular chart is described fully in literature available from Wallace & Tiernan Inc., Box 178, Newark, N. J.

What You Should Know About Venturi Tubes and Nozzles

400. A comprehensive bulletin, No. 100, of interest to all engineers dealing with the measurement of liquid flow and its various ramifications has been issued by Simplex Valve & Meter Company, Lancaster, Pa. Data on advantages, construction and installation details, range of sizes and specifications are given in simplified form.

Plastic Pipe For Liquids and Gases

514. Kraloy rigid polyvinyl chloride plastic pipe can be used for liquids and gases and will not rust, rot or corrode. Write to Kraloy Plastic Pipe Co., 4720 E. Washington Blvd., Los Angeles, Calif., or check the reply card for complete details on this lightweight pipe.

3-Way Instrument Locates Underground Pipes and Leaks

540. A single instrument, the Goldak Model LC-15, provides all-around help in water system maintenance by locating pipes and valves and detecting leaks. One-man operated, accurate and dependable, this instrument is fully described in the booklet entitled "Locating Underground Pipes" and related literature. Get your copy from the Goldak Company, Inc., 1544 W. Glenoaks Blvd., Glendale 1, Calif.

Modern Elevated Water Tanks

566. A 16-page bulletin describing 2 types of water storage tanks, the watersphere and the waterspheroid, is available from the Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill. Standard sizes from 25,000 gals. to 500,000 gals. are covered.

Tyton Joint For Water

779. McWane Tyton joint and mechanical joint cast iron pipe are described in catalog from McWane Cast Iron Pipe Co., Birmingham 2, Ala. Check the reply card for details on pipe from 2 through 12 ins.

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For detailed information on the Scavenger write to the Good Roads Machinery Corporation, Minerva, Ohio.

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Link-Belt Uniflow settling tank matches efficiency of conventional tanks in

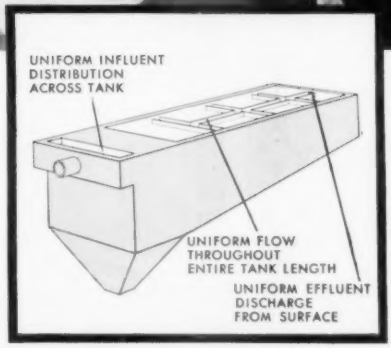
25% less detention time

UNIFLOW AT WORK. Modern sewage treatment system uses Link-Belt Straightline collectors in Uniflow settling tanks. Structural aspects of Uniflow design make possible the use of conventional equipment, give flexibility of layout to accommodate site characteristics. Here operator tilts Link-Belt Rotoline scum pipe.

Uniflow with same overflow rate as conventional tank costs less to construct

Combining a rapidly sloping bottom with a system of multiple weirs, Link-Belt Uniflow tank design increases the efficiency of solids removal from water, sewage or industrial liquids. Removal efficiency depends on overflow rate and not upon the depth of the basin. With Uniflow's sloping bottom design, tank volume is reduced as much as 25% while the surface area and resultant overflow rate remain equal to that of conventional tanks. You realize greater efficiency, lower construction and concrete costs.

We will be glad to work with your engineers, chemists and consultants. Ask your nearest Link-Belt office for Folder 2648 containing selection charts, construction details and specifications.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To order these helpful booklets check the reply card opposite page 34.

Single Gasket Type Joint For Cast Iron Pipe

602. A double-sealing gasket type joint for cast iron pipe that is easy to assemble and install is described in catalog from American Cast Iron Pipe Co., Birmingham 2, Ala. Tables on pipe from 3" to 48" are included along with recommended deflection tables. Check the reply card.

Air Control Valves For All Types of Pipelines

620. Literature on Crispin Air Valves, which safely control air in lines handling liquids, to maintain efficient operation and prevent expensive failures, is available from Multiplex Manufacturing Company, Dept. C, Berwick, Pa. Write today for your copy of the Crispin Air Valve Catalog, which offers complete information on the full line of dependable Crispin Air Valves.

Combustion Controls and Instruments

626. This 38-page catalog covers combustion controls and instruments, switch and time delay relays, pressure indicators, pressure controls, and many other valves and regulators. Check the reply card or write General Controls, Glendale, Calif.

Flexible Plastic Pipe For Water Distribution

708. A new-type polyethylene resin flexible pipe is described in Catalog No. 401 available from Orangeburg Mfg. Co., Inc., 375 Park Ave., New York 22, N. Y. Fittings, installation, size and weight tables and physical properties are several of the sections covered.

Transite Pressure Pipe For Water Systems

775. Transite pressure pipe and the Ring-Tite coupling are described in Bulletin TR-160A from Johns-Manville, 22 East 40th St., New York 16, N. Y. Check the reply card for full details on this water pipe.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N.J. Check the reply card and we will forward your request.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Combating Odors At Treatment Plants

55. Odor counteractants and consultant service on odor problems at sewage treatment plants are described in literature from Airkem, Inc., 241 E. 44th St., New York 17, N. Y. Check the reply card today.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Buckets and Grapples For Incinerator Service

110. Bulletin provides comprehensive information on the 5 sizes of 2-line, lever arm, clamshell-type buckets; standard 2-line, tine-type grapples; equalizer arrangements and certain incinerator buckets for single drum hoists. Check the reply card or write Blaw-Knox Co., 300 Sixth Ave., Pittsburgh, Pa., today.

Preload Concrete Tanks For Sewage Treatment Tanks

113. Concrete tanks for sludge digesters, clarifiers, flocculators and thickeners are covered in literature from The Preload Co., Inc., 211 East 37th St., New York, N. Y. Check the reply card for full design data.

Up-Sewer Treatment Controls Odors

129. Controlling sulfide production and the activity of odor-producing organisms by applying Cloroben at selected manholes, and at sewage treatment plants is described in a folder for your file cabinet. Write Cloroben Chemical Corp., 115 Jacobus Ave., South Kearney, N. J. or check the reply card.

Protective Lining for Concrete Pipe and Structures

131. T-Lock Amer-Plate is a tough, long-lasting acid-resistant vinyl sheet lining for concrete pipe and structures which are exposed to corrosive materials. T-shaped ribs pressed in the sheet are embedded in the concrete as it is poured to lock the lining permanently in place. Get full details from Amercoat Corp., South Gate, Calif., or check the reply card for illustrated folder.

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Incinerator Maintenance Can Be Cut!

159. There are no joints in a Plibrico lining and the lining has a positive anchorage system holding it securely in place. The stoker provides automatic ash discharge and works as a single unit. For complete details on cutting incinerator maintenance write Plibrico Incinerators, 1800 Kingsbury St., Chicago 14, Ill.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check reply card for catalog No. 1702 from Flynn and Emrich Co., Holiday and Saratoga Sts., Paltimore 2, Md.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass. Check the reply card.

Valuable Information on Underground Pumping Stations

246. The complete prefabricated underground pumping station is fully described in a bulletin just released by Zimmer & Francescon, 1715 Fifteenth Street Place, Moline, Ill. Construction features, corrosion control, electric controls, specifications, pumping equipment and installation are a few of the items covered. Check the reply card.

Modern Methods and Materials For Jointing Sewer Pipe

402. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading.

Engineering Data Manual on Underground Lift Stations

218. This 100 page manual includes descriptive bulletins, specifications covering typical installations for pump type or ejector type stations, friction loss tables covering capacities and size of pipe, pump and motor selection charts and wiring diagrams. Check the reply card or write Smith & Loveless, Inc., Water and Sewage Equipment, P. O. Box 8884, Kansas City, Mo.

Improved Design of Uniflow Settling Tanks

258. A bulletin on the Uniflow settling tank for removal of solids from water, sewage and industrial waste is available from Public Relations Dept., Link-Belt Co., Prudential Plaza, Chicago 1, Ill. This bulletin is of great value to engineers who are designing settling tanks. Check the reply card.

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Amvit Mechanical Jointed Clay Pipe

298. The new Amvit jointed vitrified clay pipe in sizes 4 through 24 inches with the true "built in" mechanical joint ready for immediate and easy installation is infiltration and root-proof. Offers better flow and less maintenance and permits deflection and absorbs shocks. It is furnished on all standard fittings and permits immediate backfilling and testing. For literature write to American Vitrified Products Co., National City Bank Building, Cleveland, Ohio, or check the reply card.

Small Unit Sewage Treatment For 20 to 5000 People

568. Bulletin 135 describes the Rated-Aeration process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Diversey Parkway, Chicago 14, Ill.

Pneumatic Sewage Ejector Pumping Systems for Low Flows

317. Dimension and capacity tables for pneumatic float or electrode controlled ejectors, cast iron or welded steel, covering flow ranges of 20 to 600 gpm, including all information necessary in design are given in Bulletin No. KSM-2 3/58. Check the reply card or write Komline-Sanderson Engineering Corp., 101 Holland Avenue, Peapack, N. J.

Solids Pump Uses Recessed Impeller

428. The Wemco "Torque-Flow" solids pump works with a completely recessed impeller which creates a vortex effect and transmits power exactly as in a fluid type torque converter. This avoids flow through impeller vanes and reduces clogging difficulties when handling sewage sludge or abrasive materials. For full details get Bulletin P10-B6 by writing to Western Machinery Co., 650 Fifth St., San Francisco 7, Calif., or check the reply card.

Vitrified Clay Floor System For Trickling Filters

452. The IMCO two unit floor is noted for its mechanical strength, simplicity of construction and large percentage openings for aeration. The units are self spacing and easily set in place. Check the reply card or write Industrial Materials Co., Somerset St. and Trenton Ave., Philadelphia 34, Pa., for complete catalog.

BUSINESS ADMINISTRATION

System For Duplicating and Filing Engineering Drawings

754. The Recordak system for comprehensive filing of engineering drawings is described in literature available from Recordak Corp., 415 Madison Ave., New York 17, N.Y. Drawings are first microfilmed and then they are added to an aperture card for indexing.

These Cities, States & Turnpikes Are Doing More Work and Paying Less with the NETCO Catch Basin Cleaner

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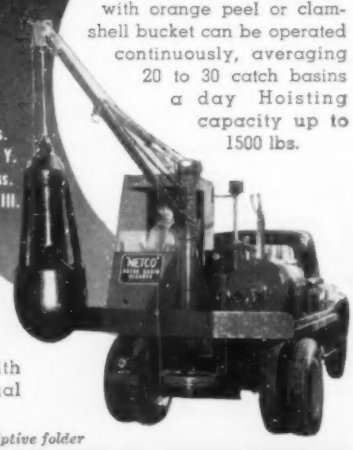
Easily mounted on any short wheel base truck with 8 ft. in back of the cab, the NETCO with orange peel or clam-shell bucket can be operated continuously, averaging 20 to 30 catch basins a day Hoisting capacity up to 1500 lbs.



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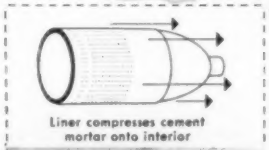
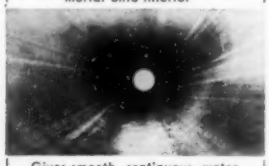


Liner compresses cement mortar onto interior



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How to select the best filter rate controller

Unless you check these 7 vital points, you won't be sure you're getting the controller that meets all your requirements

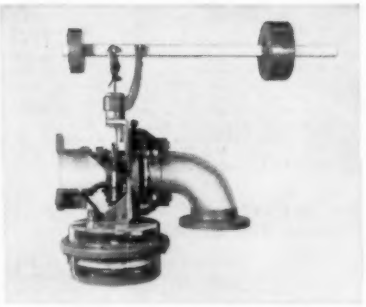
All controllers claim to fill your major requirements:

(1) hold flow at desired rate

(2) operate over wide ranges with low error

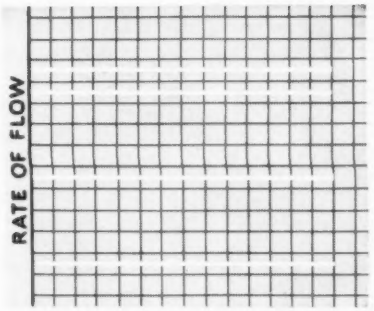
(3) maintain rate *automatically*

But the vital features outlined here determine whether or not you have selected the one type that gives you complete filter control.



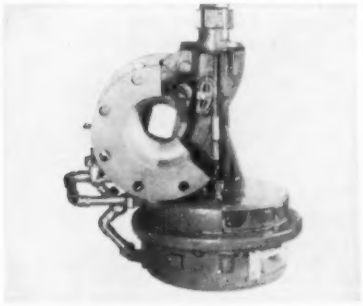
1. DIRECT ACTING

Some controllers require pneumatic or electric positioners to hold the desired rate. When power fails, filters run away. But all power can fail and the direct-acting Simplex Type S Controller (cutaway above) still keeps rate uniform.



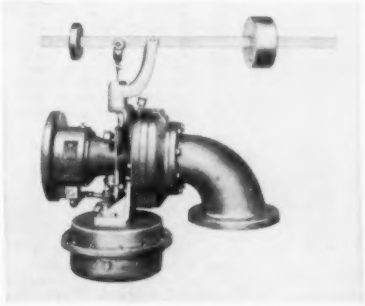
2. ACCURACY TO END POINT

Getting the longest filter run requires the most critical accuracy near the end point. That's where other controllers fail by fluctuating widely. For comparison, see above straight-line accuracy of Simplex Type S Controller.



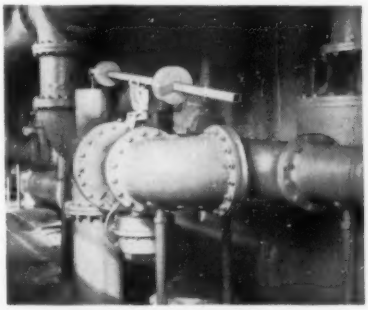
3. PRESSURE LOSS

In other controllers, plates and seats obstruct flow. Above cutaway view of Simplex Controller shows absence of obstructions. Its patented guillotine valve provides the full-line opening that gives you low pressure-loss (under 1' at maximum flow).



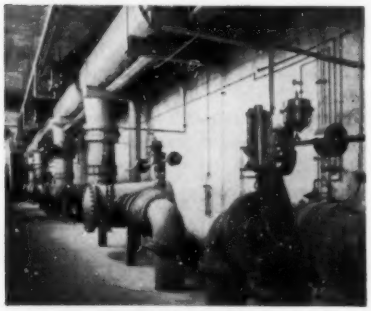
4. TOTAL INSTALLED COST

Other controllers require expensive extras: straight pipe ahead of, or after, the unit; special pneumatic or electric positioners; additional wiring. In contrast, the Simplex Type S Controller is a complete, self-contained unit.



5. SPACE REQUIREMENTS

Controllers that require straight pipe runs waste valuable space, add greatly to plant cost. But, Simplex Type S Controllers are only 3 pipe diameters long, fit anywhere, horizontally or vertically, and eliminate hidden cost of straight pipe runs.



6. MAINTENANCE COST

If used as controllers, ordinary valves require additional positioners—pneumatic or electric. Results: more moving parts; more wear; greater maintenance costs. Simplex Type S Controller is self-contained, operates without these extras, requires virtually no maintenance.

7. PROVEN PERFORMANCE

To help you select the best controller, check with the men who run filter plants. Ask for their experience. Map above shows a few Simplex installations. For others near you—with up to 25 years' successful performance, please write us.

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YOU CAN NOW SIZE METERS EXACTLY with world-renowned

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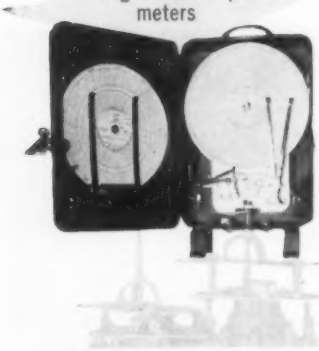

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246 Palm Street, Hartford 12, Conn.

STREETS AND HIGHWAYS

Bitumuls Paving Handbook Full of Useful Data

23. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the reply card. American Bitumuls & Asphalt Co., 320 Market St., San Francisco 20, Calif.

How to Prepare and Maintain Roadways With Calcium Chloride

65. "The Calcium Chloride Road," is the name of a new 24-page two-color catalog issued by the Columbia-Southern Chemical Corp., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa. Included are sections on dust control, gradation, placing and mixing materials and shaping. General information on spring, summer and fall maintenance is also provided. Check the handy reply card.

How to Get Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the reply card for your copy

Sidecrane-Backfiller-Tamper, A Versatile 3-Way Machine

125. A 3-way machine, the Cleveland 80W, that is a backfiller, sidecrane and tamper is described fully in a 12-page Bulletin, No. L-102, available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Design and construction features, photographs of the machine in operation and complete dimensions and specifications are covered. Check the reply card.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Finest Line of Markers for Fine Line Marking

165. Complete information on truck mounted highway markers, self-propelled line markers, all purpose line markers, and hand-propelled line markers is available from the M-B Corporation, New Holstein, Wis. Photographs and specifications of each type of line marker are included. For more, check the handy reply card.

Sand and Cinder Spreaders For Streets and Highways

175. PTO with mechanical or hydraulic operation and auxiliary engine with mechanical or hydraulic operation are the choice of drives on these sand and cinder spreaders. Check the reply card or write Baughman Mfg. Co., 152 Shipman Road, Jerseyville, Ill., for complete catalog.

The Principles of Compaction by Vibration

288. Compaction specifications that can't be met with ordinary compactors are no problem to the new Essick vibrating rollers. Complete descriptive literature explaining the principles of compaction by vibration and the Essick vibrating roller is available from Essick Mfg. Co., 1950 Sante Fe Ave., Los Angeles, Calif.

Leaf Loader and Collector

204. Complete line of vacuum type equipment for leaf and litter problems is available from Good Roads Machinery Corp., Minerva, Ohio. Units are available truck or trailer mounted and are used to maneuver in hard-to-reach places. Check the reply card.

Illustrated Specifications on Brush and Limb Disposal

222. A new booklet on the modern approach to the brush problem shows how an Asplundh chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundh Chipper Company, 505 York Road, Jenkintown, Pa., or use the handy reply card.

Why and How To Use Pneumatic Tired Rollers

290. The why and how of pneumatic tired rollers on base and surface courses, sealing completed fills, surface treatments, floated surfaces, hot and cold asphalts and stabilized soils are covered in Bulletin 10 from Tampo Mfg. Co., San Antonio, Tex. For information on operating conditions and compaction charts check the reply card.

Manual on Steel and Wire for Road Building

337. Design data on wire fabric for concrete pavements, joint data, guardrail design standards, steel and wire for concrete pipe and reinforced bituminous concrete design are some of the sections covered. Check the reply card or write American Steel & Wire Div. of United States Steel Corp., Cleveland 13, Ohio, for this valuable manual.

Advanced Tractor Design Gives Better Performance

399. The Ford Tractor offers 4-wheel stability, built-in hydraulic system, power take-off, as well as greater power, performance and economy. A complete booklet describes five tractor models in two power series, showing the latest in advanced tractor design and including many applications of equipment for saving time and money. For your copy check the reply card or write Tractor and Implement Division, Ford Motor Co., Birmingham, Mich.

Self-Propelled Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 524 T, model W-2 and a new midget ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 524 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4½ feet deep. Model W-2 Ditcher digs from 2" wide up to 4" down to a depth of 30". Full data on these ditchers available by checking the reply card.

The Trucks You Need for Every Public Works Job

461. Extra life and operating economies are built-in features of every Ford truck model. There's a chassis size and engine for each of your needs, from light utility work to heavy-duty construction jobs. Get latest literature from Ford Motor Co., Truck Div., Dearborn, Mich., by checking the reply card.

Detailed Data and Prices on Optical Repeating Transits

583. Optical repeating transits are described fully in literature available from Wild Heerbrugg Instruments, Inc., Main at Covert St., Port Washington, N. Y. Check the reply card for information on design, operation and prices.

Helpful Data on Distributors for Bituminous Materials

611. Pressure distributors featuring uniform pressure and temperature, accurate displacement pumping, convenient operation are described in literature of Standard Steel Works, North Kansas City, Mo.

Catalog on All Phases of Brush Disposal

771. This informative 2-color catalog gives complete detailed information on Fitchburg Chippers, and includes drawings, specifications, diagrams and charts. Check the reply card or write Fitchburg Engineering Corp., Fitchburg, Mass., today.

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Power Shovel, Crane and Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Division of Warner & Swasey Co., Winona, Minn. Also information on front-end loaders, truck and trailer mounted hydraulic backhoes and various attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the reply card.

Reflectorized White or Yellow Crosswalk Markings

578. Crosswalk markings of Perma-Line, the quick setting line that is easily applied, trouble-free, economical, and which outlasts paint 4 to 6 times, is described in literature of the Veon Chemical Corporation, 22-09 Bridge Plaza North, Long Island City 1, N.Y. Available in reflectorized white or yellow. Tests under your local conditions are invited.

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Literature on Reflective Glass Beads

690. Glass beads for traffic signs and street name signs are described in literature available from Flex-O-Lite Mfg. Corp., 8305 Flex-O-Lite Drive, P. O. Box 3066 (Affton Br.), St. Louis 23, Mo. Beads can be used on white and yellow signs. Check the reply card.

Diamond Blades For Sawing Concrete

766. Felker Di-Lock diamond blades for cutting concrete pavements are described in literature available from Felker Mfg. Co., Torrance, Calif. Check the reply card.

CONSTRUCTION EQUIPMENT AND MATERIALS

Tractor Loader Can Be Converted Into Eight Different Machines

38. Multiple-purpose tractor loader can be converted to a street sweeper, backhoe, fork lift, angle dozer, crane and rotary broom in a short time. Check the reply card or write Massey-Ferguson Industrial Div., 1009 South West St., Wichita 13N, Kans., for well illustrated catalog.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

Heavy-Duty Pipe Cutter Works In or Out of Trench

164. Built to stand the most severe service, the all-purpose Ellis & Ford pipe cutter, for cast iron water mains 4" through 12", is easy to use in tight places, works in or out of trench. Full details on cutter and interchangeable parts in Catalog 39, available by checking coupon. Ellis & Ford Mfg. Co., Ferndale 20, Mich.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your buildings needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Write to Butler Mfg. Co., Kansas City, Mo.

Self-Propelled, One Man Operated Hydra-Hammer

85. This unit breaks concrete pavement, tamps backfill, tamps rock or heavy aggregate, cuts asphalt, compacts blacktop patches and drives highway guard rail posts. Check the reply card or write Ottawa Steel Div., Young Spring and Wire Corp., Ottawa, Kans., for complete literature.

Manual on Coatings to Stop Rust

235. Primer type, short oil type, heat resistant, chemical resistant and floor coatings are a few of the items covered. Also complete data on Rust-Oleum products are included. Check the reply card or write Rust-Oleum Corp., Evanston, Ill., for this valuable manual.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication.

Complete Bulletin On Municipal Supplies

473. Everything from leak locators to street signs is listed in the big 108-page bulletin "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included. Get your copy of Bulletin No. 155 from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill., by checking the reply card.

What You Should Know About a Motor Grader

673. Photographs, sketches and other instruction illustrations aid readers to visualize details of the Allis-Chalmers Model Forty-Five motor grader mechanical features and components. The catalog also tells about attachments and accessories. Write Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wisc.

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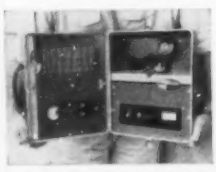

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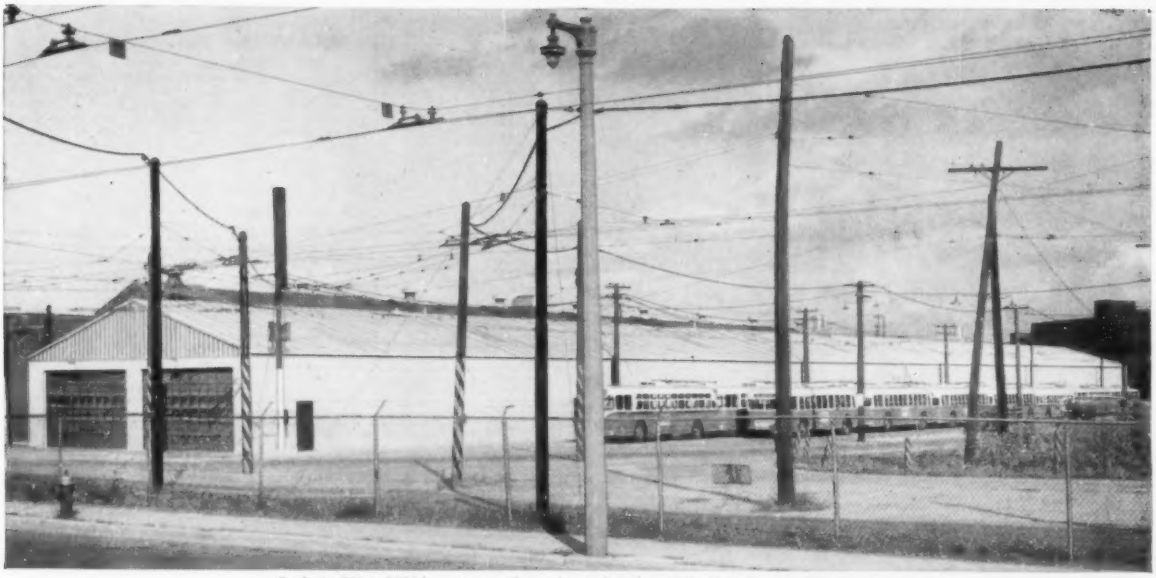

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Axles For Construction and Maintenance Trucks

767. Eaton 2-speed axles cut operating and maintenance costs in trucks. They provide easy shift, supply positive lubrication and have a self-contained air brake. Check the reply card or write Eaton Mfg. Co., Axle Div., Cleveland, Ohio.

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REFUSE COLLECTION AND DISPOSAL

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check reply card or write Gar Wood Industries, Inc., Wayne, Mich.

New Standard For Refuse Collection Equipment

763. Daybrook Power Packers with the force, crush and pack action are covered in catalog from Daybrook Hydraulic Div., Young Spring & Wire Corp., Bowling Green, Ohio. Check the reply card for information on these units that make more collections, more distance per route and fewer trips to the dump.

•

STREET LIGHTING AND TRAFFIC CONTROL

Monotube Overhead Sign Supports For Highway Marking

567. Monotube overhead sign supports for freeways, turnpikes, expressways and general highway use are described fully in catalog available from the Union Metal Mfg. Co., Canton 5, Ohio. The catalog describes in detail both double and single post designs, including assembly and installation details, dimensional data and some of the possible variations. Plenty of photographs and drawings are included. Check the reply card for your copy today.

•

RECREATION

Heavy Duty Swimming Pool Equipment for Municipal Pools

193. Illustrated bulletin showing heavily built diving and deck equipment is available from American Playground Device Co., Anderson, Ind. Check the reply card for specifications on diving boards, data on diving stands, towers, slides, pool ladders and pool cleaning equipment.

The Work Bull 1001 as Pick-up Sweeper has 63" Palmyra rotary broom, wire steel gutter brush, and sprinkler system.

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The Work Bull 1001 can also be converted into a Backhoe (with its own backfill blade), Fork Lift, Angle Dozer, Crane, Rotary Broom, and Scarifier – right on the job if necessary. And each performs its task so well that you will think it is intended for just that one purpose.

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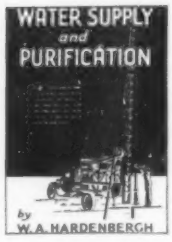

Water Supply and Purification

By W. A. Hardenbergh

Among the major changes introduced in this latest edition are the following: The chapters on ground water, on filtration, and on laying pipe and maintaining lines have been almost completely rewritten; the chapters on pipe conduits and on disinfection have been revised to bring the material in them up-to-date; and a new chapter has been added on fluoridation. Design examples of all kinds are worked out in detail to illustrate practical, up-to-date methods. To order your copy circle A-1 on the coupon.

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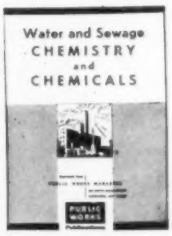

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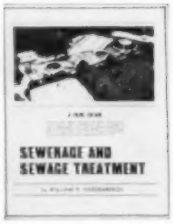
Sewerage and Sewage Treatment

By W. A. Hardenbergh



An authoritative yet simple treatment of the subject by one of the nation's foremost authorities. Mr. Hardenbergh's editorial and field work has brought him in close contact with the problems that trouble the average engineer and in this book he explains those methods most suitable for general use. Special attention is paid to sewerage systems, both storm and sanitary. Design examples of all kinds are worked out in detail to illustrate practical, up-to-date methods. To order your copy circle A-6 on the coupon.

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This valuable text has been completely revised, expanded and brought up to date. In it all phases of Sewage Treatment Plant operation are treated in simple, easily understandable language. Among the many subjects covered are: measurement flow; concentration and temperature; sampling sewage for analysis; laboratory determinations; purposes of treatment; operation of grit chambers; operation of screens; trickling filter operation; filter fly control; disposal of sludge; etc. To order your copy circle A-7 on the coupon.

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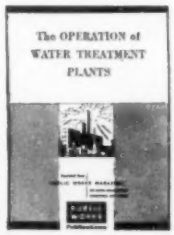
The Operation of Water Treatment Plants



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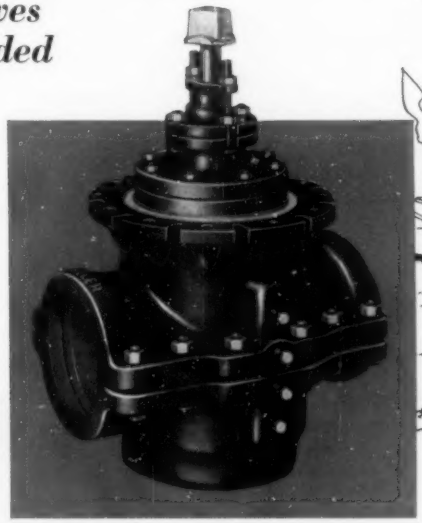

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LEGAL ASPECTS OF PUBLIC WORKS

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City of Alcoa versus Brotherhood

City of Alcoa v. International Brotherhood of Electrical Workers, 308 S.W. (2d) 476, a Tennessee Case decided Dec. 6, 1957, raised the issue of whether a union had a right to strike and to picket the office of the City's electric and distribution system, in order to compel the city to enter into a collective bargaining agreement.

The picketers were employees of the Blount Electric System, a department of the City of Alcoa, through which the city operates a retail electric distribution system, serving industrial, military, and residential properties.

The physical properties of this electric system at one time belonged to a private corporation. During that time there existed a collective bargaining agreement between the private corporation and a union. Subsequent to the acquiring of the system by the City of Alcoa, there had been no bargaining agreement by the City or the electric system with any labor organization.

On June 17, 1957, the defendant union induced a number of the electric system's employees to engage in a strike. The purpose of this strike was to compel the recognition of the union as the bargaining agent of the employees, to compel the execution of a collective bargaining agreement and to compel the reinstatement of a laid-off employee. The strike was accompanied by picketing and patrolling at the office of the electric system, and the pickets also followed employees of the system to their places of employment.

The City of Alcoa sought an injunction to restrain the union from continuing these activities.

The court first pointed out that the Taft-Hartley Act does not apply to "any State . . . or political subdivision". Hence it does not apply to the City of Alcoa. Therefore the question was one to be decided by Tennessee law. Under this law, a strike and picketing can be enjoined if they are unlawful, regardless of whether or not they are violent.

The court then held that public employees have no right to strike against a municipality, even though the city was unquestionably engaged in a proprietary, rather than a governmental function. The court said: "(All) functions performed by public authorities are public, in so far as labor relations between public employers and employees are concerned, and therefore the question whether public authorities are engaging in functions classified as 'governmental' or 'proprietary' is immaterial."

The injunction was therefore granted, restraining the union from striking and picketing.

Can You Sue a City Without a Sewer?

Bratonja v. City of Milwaukee, 3 Wis. (2d) 120; 87 N.W. (2d) 775, a Wisconsin case decided Feb. 4, 1958, was an action against the City to recover damages resulting from flooding of plaintiff's buildings by rain water.

It was contended by plaintiff that the sewer built by the City in 1906 was originally inadequate to carry away rainfall, and that it had become more and more inadequate as the years went by and more buildings were built in the area, thus increasing the fraction of the rainfall that ran down the street and collected in the low point. As a result of this, it was stated by plaintiff that its properties had been flooded from time to time, and that the failure of the City to increase the capacity of the sewer constituted negligence and a nuisance, for which the City was liable notwithstanding the doctrine of municipal immunity.

The court held, however, that a City is not obligated to build a

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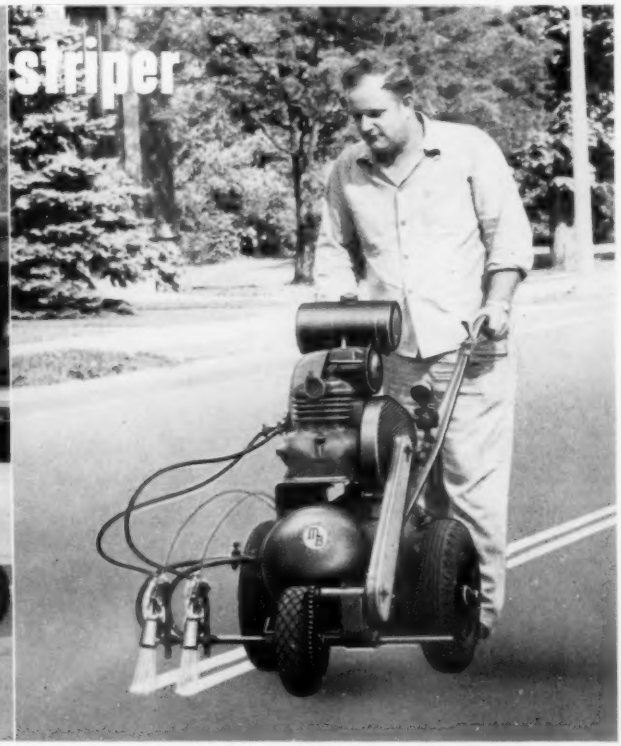

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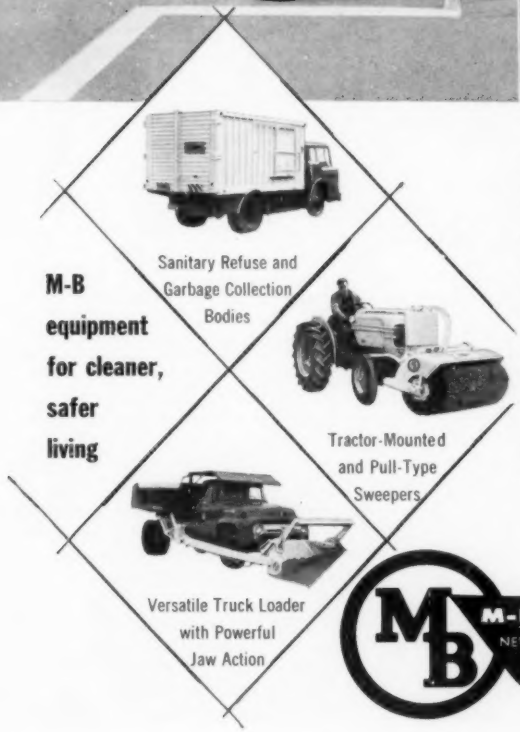
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sewer at all, or to build one large enough to carry away all the water in the street as a result of ordinary rainfall. Its liability is basically no different from that of a private landowner, who has no duty to collect surface water in order to prevent its flooding adjacent land. However, a City would be liable if it constructed a sewer and then, because of its negligence in construction or operation, *increased* the amount of water which flowed onto someone's land, e.g. by a break in the sewer.

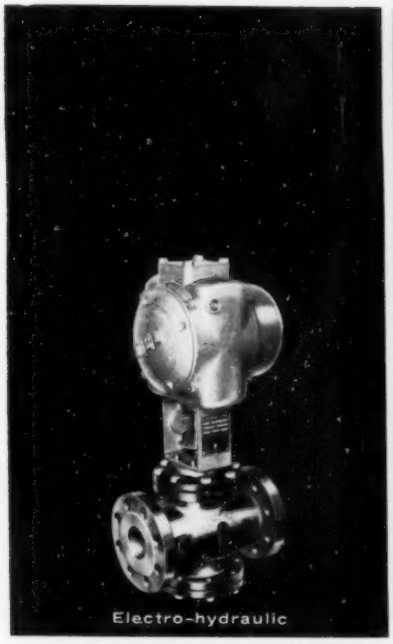
The plaintiff actually alleged that part of the damage was caused by backing up of water from the sewer, which would seem to bring him within the above exception. However, the court held that he had not shown what part of the damage was caused by uncollected surface waters (for which there was no liability), and what part by backing up of the sewer (for which there would be, in principle at least, liability). Therefore, plaintiff was not entitled to any damages on a negligence theory.

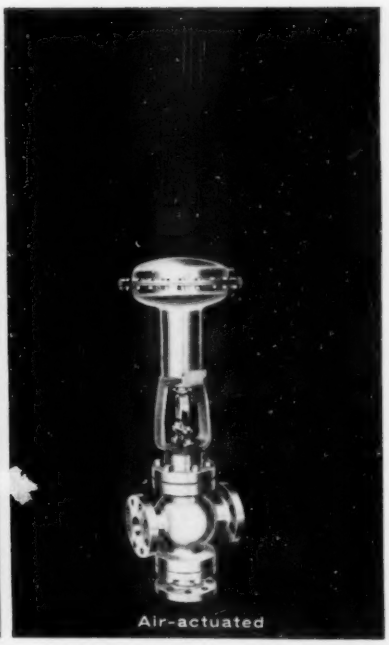
The court also said that "nuisance" was a mere label, which could add nothing to plaintiff's case. Therefore, he recovered no damages.

There is a conflict of authority among the various jurisdictions on the question of the liability of a city for inadequate sewers. (18 McQuillan on Municipal Corporations, 3d Ed., Sec. 53. 123).

LAWS OF WATER ALLOCATION

A symposium on the law of water allocation in the Eastern United States was held in Washington, D. C., about two years ago. Sponsored by the Conservation Foundation, papers and discussions were designed to clarify the need for more effective usage of our water resources by reviewing carefully the law on water usage as it has developed over the years in the East. The proceedings are now available in book form. State water rights legislation and water allocation policies are discussed in some detail. Riparian laws in Massachusetts, North Carolina and Michigan were covered in excellent papers and dis-





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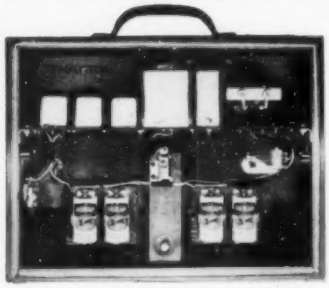

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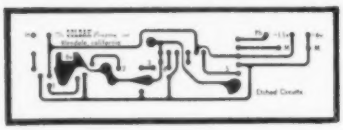

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cussions. Western experience, where the laws treats ownership of water differently, is considered in its application to Eastern conditions. There are many other papers, interesting and valuable, on this growing problem of water use. The paper bound text contains 636 pages, plus a bibliography. It was edited by David Haber, Professor of Law at Rutgers University, and Stephen W. Bergen, assistant director of Research, The Conservation Foundation. The price is $7.50. It is published by the Ronald Press Co., 15 East 26th St., New York 10, N. Y.

FUNDAMENTAL AND PRACTICAL CONCEPTS OF SOIL FREEZING

The nine reports in Bulletin 168 add much to the published information, be it of a practical nature or theories and hypotheses, concerning the fundamentals of the soil-water freezing phenomenon. Three papers deal with the practical aspects of the relative thermal conductivities of different soils and pavements as they influence soil temperatures; the ability of engineers to compute pavement temperatures from data contained in weather reports; and loss and recovery of bearing capacity of a wide range of soil types. Some evidence is given that the freezing point depression at the icewater interphase determines the soil moisture tension that acts as the driving mechanism. Other evidence is presented to validate the theory that the upward flow of water toward the freezing zone is not accompanied by vapor diffusion; and, experiments show that a capillary meniscus disappears as water comes into contact with the downward freezing ice lens. Additional measures have been made of the relative amounts of frozen and unfrozen water in various types of soils—and the influence of that water on the properties of the soils. Copies of this bulletin are $4 each, and are available from the Highway Research Board, 2101 Constitution, Washington, D. C.

BUILDING TOMORROWS

This is the title of the annual report for the city of Wichita, Kansas, as presented in narrative strip with 102 colored slides. This is the fourth year that this method of reporting has been used. Frank H. Backstrom is City Manager; E. N. Smith, Director of Public Works; and Madison F. West, Information Officer. With the color slides, the report, which is on tape, runs 27 minutes.

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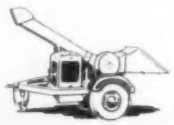

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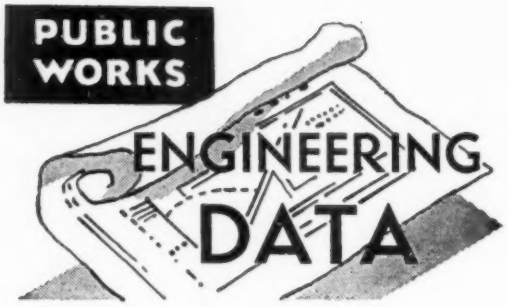


How Reliable Are Overflow Rates as Design Criteria for Sedimentation Basins?

The 1957 annual report of the New Rochelle, N. Y., sewage District Treatment Plant of the Westchester County Department of Public Works describes some experiments with sedimentation basin and weir overflow rates. The tests, conducted under the supervision of Plant Superintendent James M. Brown, attempted to evaluate overflow rates in terms of suspended solids reduction. The average basin overflow rates during the period of study varied between 440 and 910 gpd per sq. ft. The raw sewage suspended solids concentration varied from 105 to 154 mg/L, and percent removal from 44 to 62. It appeared from the tests that the raw sewage suspended solids concentration had more to do with the percent suspended solids removal than either the basin overflow rate or the detention period. At overflow rates greater than 1000 gpd per sq. ft. and suspended solids concentrations higher than 150 mg/L, a percent reduction in excess of 60 could be obtained. On the other hand, it was impossible to obtain a 60 percent reduction at rates less than 500 gpd per sq. ft. when the suspended solids were less than 100 mg/L.

It was concluded that a satisfactory degree of removal of suspended solids in a sewage of moderate strength can be attained at overflow rates of 1000 gpd per sq. ft. A similar situation was found to exist with regard to weir overflow rates. There was no significant difference in sedimentation efficiency whether the weir overflow rate was 15,000 gpd per linear foot or 40,000.

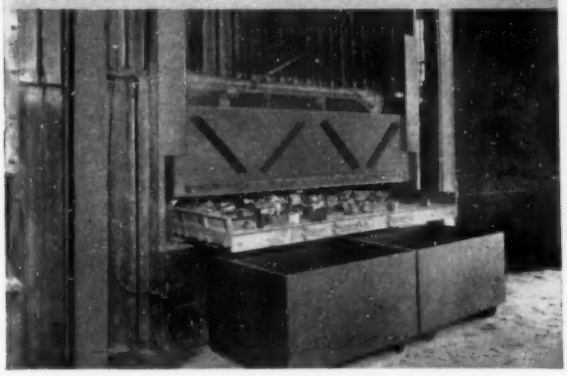
The plant was designed for a basin overflow rate of 585 gpd per sq. ft. and 7500 gpd per foot of weir at a flow of 15 mgd. Four basins are provided, each 156 by 41 ft. and 7 ft. deep. From the experimental results, it was decided that with the current average flow of about 10 mgd, two of the basins need not be operated except for standby service.

Disposal of Incinerator Residue and Non-Combustible Waste in Philadelphia

The Streets Department engineering staff of the City of Philadelphia, Pa., has started a study to provide a secure and long-term method for the disposal of incinerator residue and other non-combustible material. This study will include a consideration of various possible disposal sites, the most desirable methods of reaching these sites (such as water, rail or truck), and the economics of carrying refuse to transfer stations. Based on results of this study, it is expected that by 1961, the City will have determined what method or methods should be used to carry material to the ultimate disposal site. At that time,

A PLIBRICO INCINERATOR

WITH THE
COMBUSTIKATOR STOKER



COSTS LESS TO BUILD, OPERATE, MAINTAIN

You can cut the size of your incinerator building by a full story . . . and save accordingly . . . when you specify a Plibrico Incinerator equipped with the effective new Combustikator stoker. Tried and proven at Skokie, Ill., this stoker provides automatic ash discharge, eliminating the need for costly, space-consuming ashpits . . . hence the full story saved. Additional savings can be realized on the cost of the incinerator itself, the amount varying with the type of ash handling system you prefer.

Operational savings can be affected through reduced man-power, for in addition to automatic ash discharge, the Combustikator has a stoker surface that's self-cleaning.

From the maintenance standpoint, the anchored monolithic lining of a Plibrico Incinerator is more durable than ordinary fire brick construction. It's the joints that cause trouble and needless expense, and a Plibrico lining doesn't have those countless joints.

Plibrico designs incinerators for municipalities of all sizes. Discuss your needs with us or with your local Plibrico distributor. Find out more about the advantages above, and many others as well. To effect the greatest savings, do it before you finalize your plans.

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EQUALS
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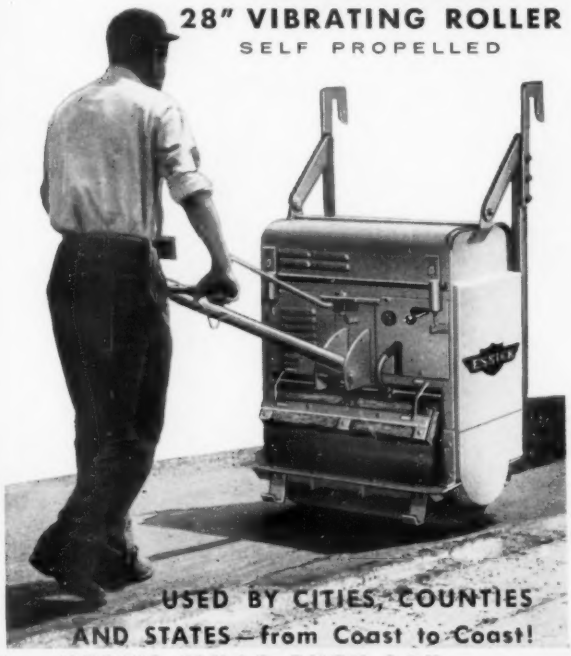

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HERE'S WHAT THEY SAY:

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- "BEING SELF PROPELLED it is easily operated....rapid expert work can be produced with little or no effort."
- "THE CARRYING HANGERS (patent pending) for tail gate attachment provides the most convenient and lowest cost haulage we have ever experienced in our paving maintenance."

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WITH CARRYING HANGERS
(PAT. PENDING)

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850 WOODRUFF LANE, ELIZABETH, NEW JERSEY
AFFILIATED WITH THE T. L. SMITH COMPANY, MILWAUKEE, WISC.

Trenching and excavating need not hold up schedules when you have a HOPTO. Model 200 HOPTO has a fast, smooth cycle, a 200° uninterrupted swing, and a digging capacity and ease of operation that knows no equal in its size and class range! Trenching or 'square-cornered digging' is simply handled by 180° wrist action of bucket.

HOPTO digs 13½ feet deep . . . is easily converted to shovel bucket in ten minutes! It's the field-proven hydraulic excavator that equips you to do more work, *in less time, at lower equipment investment.*

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the first phase of the capital project will begin, including the purchase of land and the preparation of plans and specifications by the consulting engineer for construction of the transfer stations, disposal site receiving stations, and facilities for carrying the refuse from the transfer to the receiving stations. Initial funds will provide for construction of one wharf, a receiving station installation at the disposal site, purchase of marine equipment for initial operations, and for continued engineering studies for the complete project. The program is based on an anticipated decision to employ water-borne transportation as the ultimate means of disposal as recommended by consulting engineers in 1949, and is based on a finding that there would not be enough dumping space available in and around the City to last thirty years.

The 1958-1963 capital improvement program includes provision for three 600-ton incinerators. The site for only one of these has so far been selected.

First Water Desalting Plant Will Save City $40,000 Per Year

The first water desalting plant to serve a city in this country will be constructed for Coalinga, Calif. The 28,000 gpd electric membrane plant will furnish a separately distributed drinking and cooking water supply for the city.

While Coalinga has always had plenty of well water, it is too salty to drink. Fresh soft water has been hauled 45 miles by rail for some 50 years, and at a considerable cost. Last year the water freight bill for the city was over $43,000 for about 17,000 gallons per day. The new plant, built by Ionics, Inc., will expand the drinking water supply 50 percent by electrically removing excess minerals from the brackish well water which contains about 1/15th as much salt as sea water. The plant is expected to save the city over $400,000 in the next 10 years.

The action followed a successful two-month demonstration of a smaller Ionics desalter, during which time the citizens sampled the desalted water and compared it to their rail car supply. Most people were unable to tell any difference between the two waters.

The Ionics process is a method of freshening waters which have 1/30 to 1/3 as much salt as sea water, but are still undrinkable. It relies on an electrical current which passes through the salty water and removes the atomic-size salt particles. Special plastic membranes allow the salt to pass through but retain the desalted water. The desalted water is pumped to a water tower for distribution and the salts removed are flushed away as a weak brine.

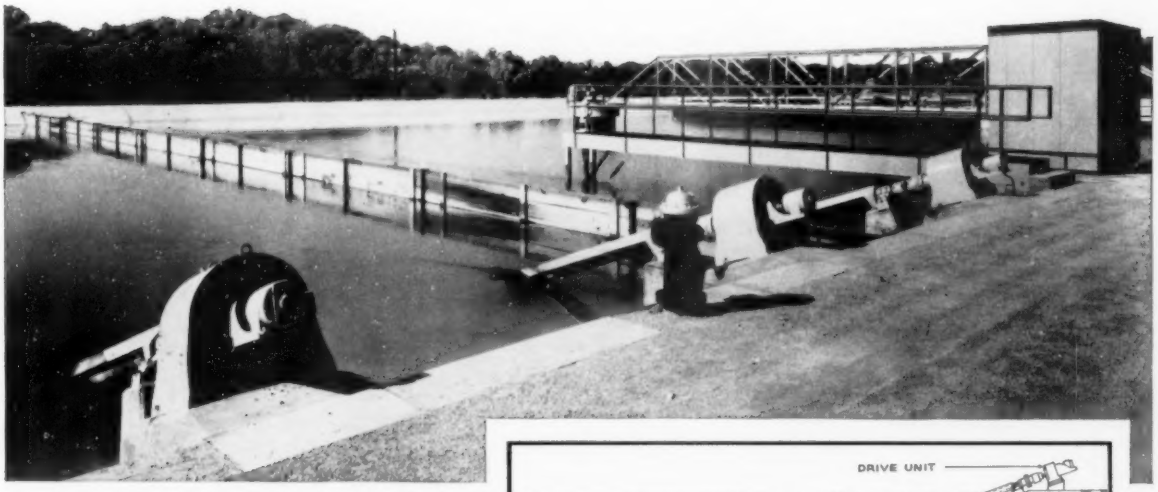
The Coalinga installation represents important progress along the road to a solution of the world's growing water supply problem.

Codification System Governs Purchases by a City

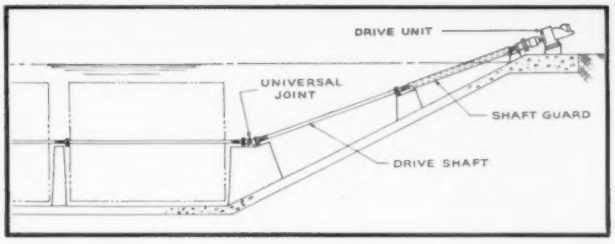
Approximately 60,000 different items are purchased by the City of Milwaukee each year. These are identified by a codification system established several years ago by the City Comptroller and the City Purchasing Agent. During 1957, $11,095,687 was spent for purchases by the city. Cash discounts earned by making prompt payments for these purchases amounted to $61,403.15.

This information appeared in the Annual Report prepared by Joseph W. Nicholson, Purchasing Agent and A. H. Lehrbaummer, Deputy Purchasing Agent.

unique FLOCTROL® drive
...new **JEFFREY** *design cuts costs 3 ways*



Three Jeffrey FLOCTROLS at St. Louis County Water Treatment Plant, St. Louis, Missouri, employ unique parallel-to-inclined-sidewall drive arrangement.



Jeffrey sanitary engineers designed the unique FLOCTROL drive shown above. Shaft runs parallel to the inclined sidewall of clarification basin and underwater universal joint is coupled to the horizontal FLOCTROL shaft. Drive shaft is protected at water surface by a steel guard which prevents fouling due to ice formation.

This efficient new Jeffrey FLOCTROL drive affords 3-way savings:

It is less expensive than drives of conventional design • Eliminates costly concrete and steel superstructures • Eliminates undesirable sprocket and chain drive through water.

Jeffrey FLOCTROLS are available in horizontal and vertical types. Horizontal units are usually installed in large plants, vertical units in smaller plants. FLOCTROL Systems eliminate short circuiting through the basin . . . provide tapered mixing for fast floc formation . . . permit 30% smaller basins than are customarily required.

For details on all Jeffrey equipment for water, sewage and industrial waste treatment, write for Catalog 905. The Jeffrey Manufacturing Company, 947 North Fourth St., Columbus 16, Ohio.

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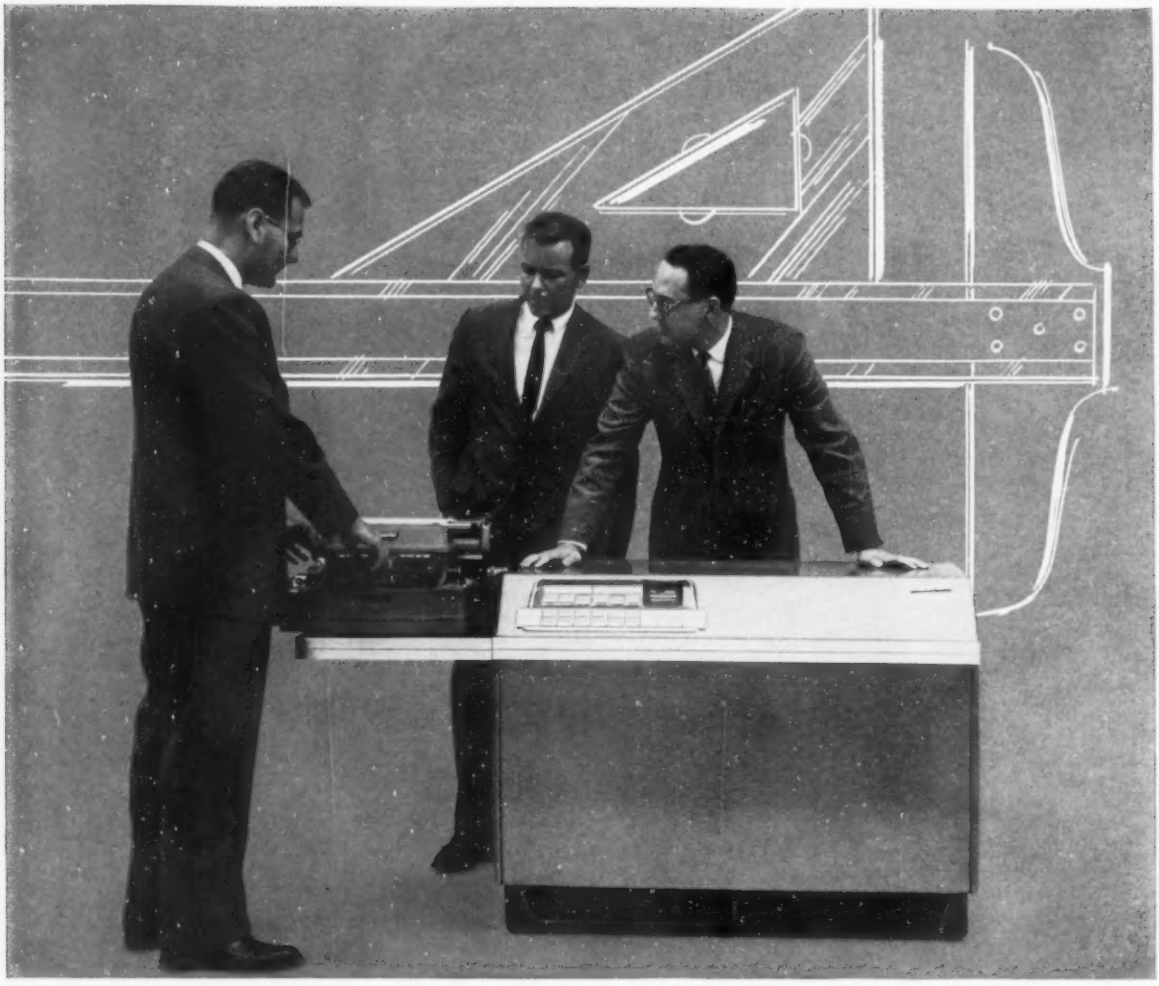


Get greater productivity in highway design with this powerful electronic computer

ROYAL PRECISION LGP-30

Large capacity... easily programmed and operated... mobile... low in cost

Here, at last, is a complete general-purpose electronic computer within the reach of every civil engineering firm. Remarkably small in size, completely mobile, LGP-30 saves time and money in the design of dams, bridges, highways . . . eliminates the tedium of routine calculation by bringing high-speed computation *right to your desk.* And at the lowest cost ever for a complete computer system!

Faster answers; unusual capacity. With speed and memory (4096 words) comparable to computers many times its size and cost, LGP-30 gives you fast, effortless answers to such problems as cut and fill, grade profile, traverse closure, field stakeout, bridge design, highway alignment. Self-cooled, LGP-30 operates from any convenient wall outlet, gives you stored-program operation for greater flexibility. (For example, highway design geometry breaks down into approximately 14 different component problems; these may all be stored in the LGP-30 and used in whatever combination is required.) Thus you save valuable time, cut costs, better your competitive position.

Easy to operate and program. LGP-30's remarkably simplified controls may be operated with only minimum computer experience. Answers are printed out directly . . . do not require deciphering. Programming is easily learned. A library of sub-routines, plus programs for a wide variety of applications, are available.

Wide range; exceptional value. The most powerful computer of its size yet developed, LGP-30 is the greatest value in today's market. Smallest initial investment ever for a complete computer . . . low operating and maintenance costs. Service available coast-to-coast.

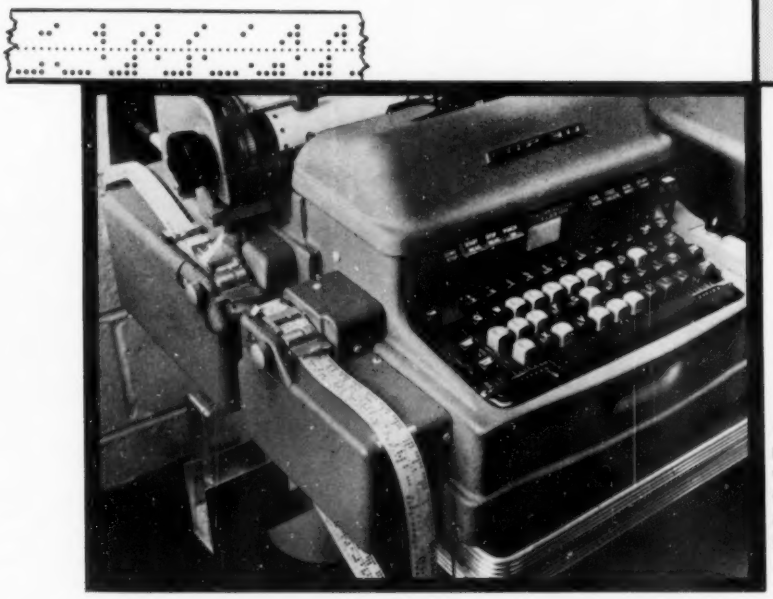
For further information and specifications, write Royal McBee Corporation, Data Processing Equipment Division, Port Chester, N. Y.

ROYAL McBEE

WORLD'S LARGEST MANUFACTURER OF TYPEWRITERS
AND MAKERS OF DATA PROCESSING EQUIPMENT

PUBLIC WORKS MAGAZINE

VOLUME 89, NUMBER 7
JULY, 1958



● DATA are fed to computer by punched tape or from Flexowriter typewriter keyboard. This picture shows tape read-in and the tape punch immediately behind. A strip of the punched tape is shown above the picture at left.

COMPUTER APPLICATIONS *for a* Small Consulting Firm

E. G. BRENDER, J. O. FRANK and T. A. WEYAND,

**Brender & Brender, Inc.
Consulting Engineers,
Wayne, Michigan**

THE ENGINEER and Land Surveyor finds himself doing up-to-date projects with methods and procedures initiated a generation ago. These methods have been undergoing rapid and major changes in the last year with the application of electronic digital computers. In the big-volume, high-value, time-rushed projects the computer has become a necessity, but only recently has the requirement for computers been apparent in the smaller and more varied engineering firms.

Since engineering problems are a series of logical sequential operations on data and other factors, computers which function in this pattern have a direct application. Our Royal-McBee LGP-30 operates serially, or sequentially, with a program of instructions stored in its magnetic drum memory.

Data and instructions are fed to the computer either by punched tape or directly from the Flexowriter typewriter keyboard. The data and instructions are prepared on the Flexowriter which punches the tape and gives a typed copy at the same time. The instructions can then be fed into the computer any time, and any number of times. The answers are typed, or punched, or held internally, depending on the instructions contained in the program. When the answers are typed out by the Flexowriter, they are available for immediate use without any further decoding or interpretation.

Programming

Programming is accomplished through the use of sixteen commands whereby the data is summoned to the accumulator, or main register, with a "bring" order. This data will be operated on, which may be a number to be added to, subtracted from, multiplied by, or divided by, according to the next instruction in the program sequence. The result is then in the accumulator and can be printed out, or stored in memory for subsequent use.

Transfer instructions allow the programmer to control the sequence in which instructions are executed. Clear and hold orders record the contents of the accumulator in a particular memory location and clears itself, or retains the contents for additional operations. The average engineer can learn the operation of the LGP-30, and become a fairly good programmer in a week. A group can use the computer effectively without the necessity of hiring specialized personnel, in fact,

a secretary or typist can load programs and prepare data.

The LPG-30 can be put any place there is room for a desk and be plugged into any standard 115-volt, 60-cycle, single-phase outlet. Operating power is 1500 watts under full load, and 40 watts in its standby state. It requires no air conditioning as long as the room temperatures are within comfort limits for the operator. It requires only two minutes to warm up and be ready to operate. Most engineers are likely to require a little more time than this.

During its actual computing and operating time, the computer can be regarded as 100 percent accurate. Malfunctioning or breakdown is evidenced by weird answers, or complete stoppage. However, as with any piece of equipment of a comparable nature and complexity, these things can be expected at unpredictable intervals. To date we have experienced 83 percent availability. The down time has included all preventive maintenance operations, and repair service. Error-free operation periods up to 134 hours have been obtained, which is equivalent to roughly 16 years of computation by a man and a desk calculator. In time of need, the training and availability of the service man is all important. The service organization of the LGP-30 has met these needs.

Problems Solved

Surveyors are well acquainted with the laborious calculations involved in solving a traverse closure. To the uninitiated, a traverse closure is used to make field data mathematically correct. For example, when a surveyor measures the interior angles of a parcel of land, the sum of these angles should add up to a multiple of 180° exactly, in plane surveying. This rarely occurs due to instrument errors, refraction, human errors, etc. Errors also occur in the measurement of the distance of each side. The mathematics involved in a traverse closure is to distribute these angular and linear errors in a prescribed fashion to all the field data so that the resulting figure is geometrically correct. Of course, the angular and linear errors must fall within preestablished limits of precision before they are adjusted. If they don't, the field data is not precise enough and has to be rechecked.

The methods for computing the error of closure and distributing the error involves the trigonometric functions. When calculations are done with logarithms or desk calculators, eight place tables are necessary to obtain the desired accuracy. It is quite easy to make a mistake in looking up or copying down an eight digit item. It is also relatively easy to push the wrong button on a desk calculator. In addition, the square root of many large numbers must be determined accurately. Part of the field data includes the temperature at the time the measurement was made, and a temperature correction has to be applied to each side before the adjustments are made.

● **TRYING OUT the new machine. From left to right are Edward G. Brender, Peter E. Brender, T. A. Weyand and Jean O. Frank. "Time saving and accuracy" result.**

For a traverse composed of ten to fifteen sides, usual methods take more than a day's time to adjust the bearings or azimuths, and distances for each side, compute the co-ordinates for each point of the traverse, and find the area of the enclosed figure.

Including the data punching, this same ten to fifteen sided traverse can be processed on the LGP-30 in about 15 minutes. The data punching requires 10 minutes of this time, but is worth the effort in permitting closer checking, furnishing a permanent record, and for later use during the inevitable changes and revisions.

The high speeds of this electronic tool can greatly increase the capabilities of a surveyor. For instance, a field crew can be working 50 miles out of town, telephone in the results of a field traverse, and in 15 minutes, know if they should come home, or stay and recheck their field data. Also, a traverse check around an old platted subdivision can tell of difficulties before a field crew is assigned to a lot survey. Our particular traverse closure program can use either plat dimensions directly as input, that is distances, and bearings in degrees, minutes, and seconds so that plat checking agencies of governmental bodies can quickly check the accuracy and area of platted subdivisions and lots, or field data composed of temperatures, distances, and interior angles. As our program now exists, bearings, or azimuths, or interior angles, all in degrees, minutes, and seconds can be the input and any of these, but not necessarily matched, can be the output.

A computer of this size can also be used as a "glorified" desk calculator. A good example of this is also in the surveying field, i.e. the computation of plats for subdivisions. The mathematics involved are similar to the traverse closure, except points and their co-ordinates are used more than the lines and their directions. In these computations, the direction and length between two points; the co-ordinates of the next point; solving the involved and lengthy cosine law; or given the bearing and end point co-ordinates, find the length of the two sides and their point of intersection; or solving the various curve equations occupy your time, but it is the same thing repeated many times. By programming these equations and storing them on the memory drum, and referring to them at the appropriate times, the solutions are practically instantaneous so that the engineer can concentrate on the total problem rather than the mechanics of solving the individual equations.

Other applications have been the translation and/or the rotation of

co-ordinates in one system to a new set of axes and point of origin. Heretofore it has been too time consuming, if not too expensive, to attempt it. Using the LGP-30, they can now be processed at a rate of 60 to 100 per hour.

The determination of special assessment rates for public improvements has been one of the areas where more information was needed for municipal officials to make sound and logical choices. To obtain cost breakdowns by streets, districts and total summaries is not only time consuming, but subject to human error. We can perform the original estimate computations, keep track of individual blocks, produce more information than obtained previously, and be ready for the inevitable changes due to financial limitations and public hearings in less than 5 percent of the time previously required. The results are obtained directly on duplicating masters, with no additional transcribing. A direct comparison of this has been obtained on a street paving program for the Village of Wayne, where the estimate that required the efforts of three men for 10 days, plus a typist, can now be processed in four hours.

Hardy Cross Analysis

The evaluation of water and gas distribution systems with the Hardy Cross Analysis method has been put to good use both manually and with special analog computers. The general purpose digital computer can handle this analysis as well, and do an entirely different thing tomorrow. The system is numbered by loops and pipes within the loop which serves as identification. The physical data of the pipe is then fed in, in units familiar to the engineer, diameter in inches, length in feet, and a dimensionless roughness coefficient, and then combined into one constant for storage. The first assumption on the flow within the pipe is fed in at the same time. From here, the LGP-30 methodically goes through the system, pipe by pipe, and loop by loop, until the unbalanced head loss around each loop is less than any prescribed limit. The lower the limit, the more iterations required to obtain the desired precision. In fact, since the machine time is directly proportional to the number of iterations, a counter has been built in the program to give the cost at a fixed sum per loop iteration. Through the use of this program, we have reduced the time required for a 21-loop, 54-pipe system from 60 hours to 1 hour of machine time. The program can handle up to approximately 1200 pipes, in almost any combination of loops. From this it can be seen that a system can be analyzed under average flows, maximum day, or maximum hour, with appropriate fire flows, to evaluate capabilities, discover weaknesses, or plan reasonably for future growth.

The computation of earthwork quantities was one of the early computer applications. We have a program to handle areas up to 4,000 feet wide, with unlimited length by processing the data in sections, with automatic carry over of accumulated totals. This program has not only achieved similar time savings, but improved the accuracy of results. It has reduced personnel time by accepting field data and doing the required reduction to elevations incidental to the data read in.

In fact, this feature of releasing personnel is the most appealing feature of our computer application. Time saving and accuracy team up to double, or more, the capabilities of our present force. The cost saving that has served so well to justify computer installations is not present. Overhead and unit time costs increase, but are more than offset by the ability to accomplish more.

The ease of programming in basic machine language on the LGP-30 is most important to us since programs are not static, but need to be updated or modified for various applications. It is interesting to note that the ability to program depends upon the background and experience in a particular field; civil engineering, aeronautical engineering, accounting, etc., rather than mathematics and numerical analysis. It must be realized that programming is the time consuming factor in computer applications but programming is still a secondary part of using a computer to gain the tremendous advantages of electronic speeds.

DIGESTER CLEANING

Reveals SNAILS by the TON

S. C. SMITH,
Supt., Sewage Treatment Plants,
and
E. M. ALLGEIER,
Allgeier, Martin and Associates,
Joplin, Missouri

OUR SEWAGE treatment plant laboratory analysis indicated a sizable reduction in primary digester capacity in 1954. This resulted from rapid build-up of scum in our Turkey Creek Plant. Upon analyzing the contents of this digester scum blanket, it was found to consist of hair, matches, snail shells, etc. All available methods were used in an attempt to control and eliminate these materials, but the floating scum blanket continued to increase in depth and volume.

By May, 1956, the scum blanket had increased to a point necessitating a complete digester cleaning operation. At this time the scum volume was approximately 28,270 cubic feet, or 50 percent of the working volume of the primary digester. The weight of the scum blanket had seriously damaged the interior piping and structural members of the tank interior. Its removal and the necessary repairs to the digester became an exceedingly difficult, expensive and obnoxious extra-curricular 24-hour a day project for City personnel.

In order to continue plant operations during the cleaning program, which started in May, the raw sludge

was diverted to the secondary digester. Prior to this, the secondary digested sludge was drawn to the drying beds and primary sludge transferred to the secondary tank. The inspection hatches on the primary were opened and the gas dome removed to provide tank ventilation. By sludge and liquid transfers from primary to secondary, the tank content was reduced until only the scum material remained.

To use a derrick or clam shell to remove the scum material from the digester openings was impractical. Consequently, a large earth bank storage lagoon was built, with one side extending to about 60 feet from the digester. To provide drainage from the digester to the lagoon, a wooden flume was placed in an open ditch. An excavation was made to permit access to the digester wall at the tank floor elevation. A pattern for a 30-in. opening was outlined on the 12-in. concrete wall. Air drills and chisels were used to cut a recessed section about 8 ins. deep in the tank wall, care being used to avoid drilling completely through the wall. The reinforcing steel was removed from the openings, with a wall thickness of three to four inches remaining.

Wooden plugs were then fabricated to the size of the drill bit and the remaining wall thickness was drilled, a plug being placed in each hole. The several plugs and the connecting concrete were removed. This permitted a controlled volume of scum material to flow from the opening into the flume and thence to the lagoon. Streams of water under high pressure were utilized to soften the scum and assist in clearing the flume.

This removed the scum to the digester floor level, but due to the floor slope, a depth of 0 to 6 or 7 feet of scum remained in the tank. This was softened with streams of water under high pressure and pumped to the lagoon using diaphragm mud pumps.

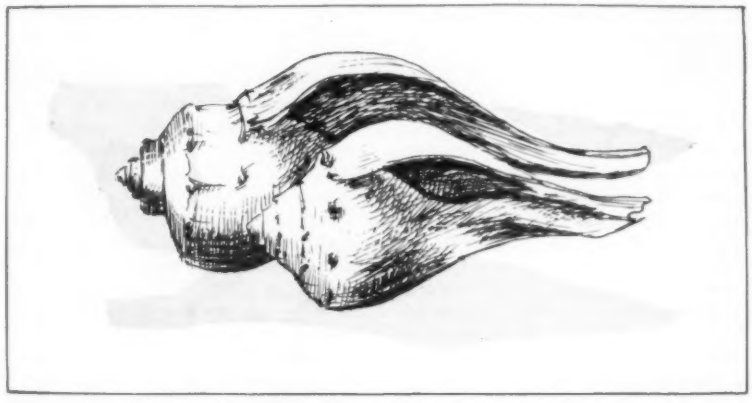
Digester Repairs

Upon completion of the cleaning program, the damaged piping and supporting members were repaired and a steel bulkhead installed in the tank cleanout opening. If another cleaning operation is ever required, this bulkhead will save much labor.

The cleaning program was completed with the plant in operation; no sewage was by-passed. The secondary digester carried the complete sludge load during the cleaning operation without serious difficulties. The primary digester was re-seeded by reverse transfer of sludge from secondary to primary. Digestion was re-established in a few days with no difficulties.

It was evident that measures were urgently needed to control the scum problem. A planning program was requested to devise a method to break down and, if possible, eliminate such scum-forming material. A consulting engineering firm was retained and investigations and studies initiated.

It was found that the "Perth" System of digester gas re-circulation had been successful in scum control at Washington, D.C., Tulsa, Okla., and other places. This equipment was installed in the Turkey Creek primary digester during May, 1957. Cost of this system, which included an electric motor-driven gas compressor, motorized valves, etc., amounted to $6,210. The equipment was installed by the plant personnel.



● **ARTIST'S conception of the troublemaker in the Joplin digester. This enlarged view shows one of the several varieties of the univalve mollusk called periwinkle.**

An analysis of the scum blanket material indicated it contained a high percentage of periwinkle or snail shells. After considerable study and investigation, it was determined that the snails must be removed from the sludge prior to entering the digester if satisfactory plant operation were to be maintained. To accomplish this, a stilling basin and basket screen were designed. It was also necessary to provide a pumping station, complete with wet well and interconnecting piping, to transport the snails from the settling tanks to the new snail removal units.

The limited information available regarding snail control disclosed that snails are present in practically all trickling filters, but that the Turkey Creek snail volume far exceeded the average concentration of comparable plants. Careful engineering investigations were required to determine the specific gravity and settling rates of the snails, pressure line velocities, pump capacity, and screen sizes. These investigations indicated the necessity of maintaining adequate velocity to transport the snails to the collecting basin. Then a reduction in velocity must occur to allow settlement to the floor of the stilling basin. To remove any snails that might not be collected by the stilling basin, a fine mesh stainless steel basket type screen unit was also designed.

The overall operation of these units has resulted in a removal of 80 to 85 percent of the snails by the stilling basin. The remainder is removed by the screening unit.

To date, the Perth System and the snail removal units are operating in a satisfactory manner. Approximately 20 cubic feet of snails are collected on the settling basin and screen unit each day. There was a build-up of scum, largely snail shells, in the digester between the cleaning in May, 1956, and the time of installation of the snail removal equipment. It is anticipated this scum blanket can be eliminated gradually without the necessity of a second digester cleaning operation.

The engineering and construction program was completed under the direction of Allgeier, Martin & Associates, Consulting Engineers, Joplin, Missouri, and the Department of Public Works of Joplin. The excavation equipment installation, trenching, backfill, etc., were accomplished by the public works and sewage treatment plant personnel of the City. The electrical work, concrete and steel construction were by contract. The direct cost of completing the program was approximately $16,500, which sum does not include any allowance for use of City labor or equipment.

Design of RETAINING WALLS

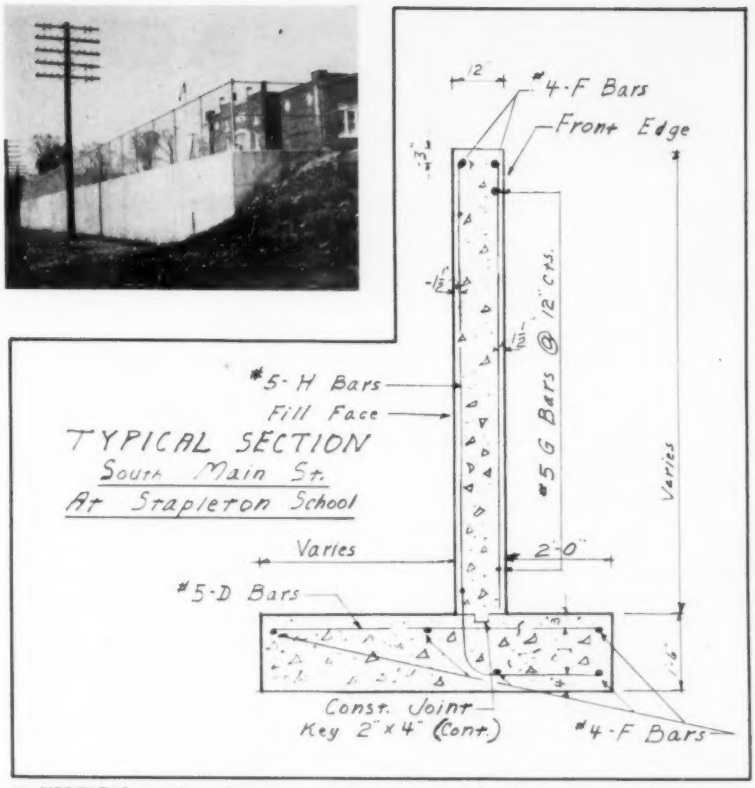
R. B. RIDDLE,
City Manager,
Joplin, Missouri

RETAINING walls are constructed for the primary purposes of protecting a lot, or parcel of land or to reclaim a parcel of wasted land in municipalities. Joplin, Mo., has constructed two retaining walls for business development and for protection at a school on a main street.

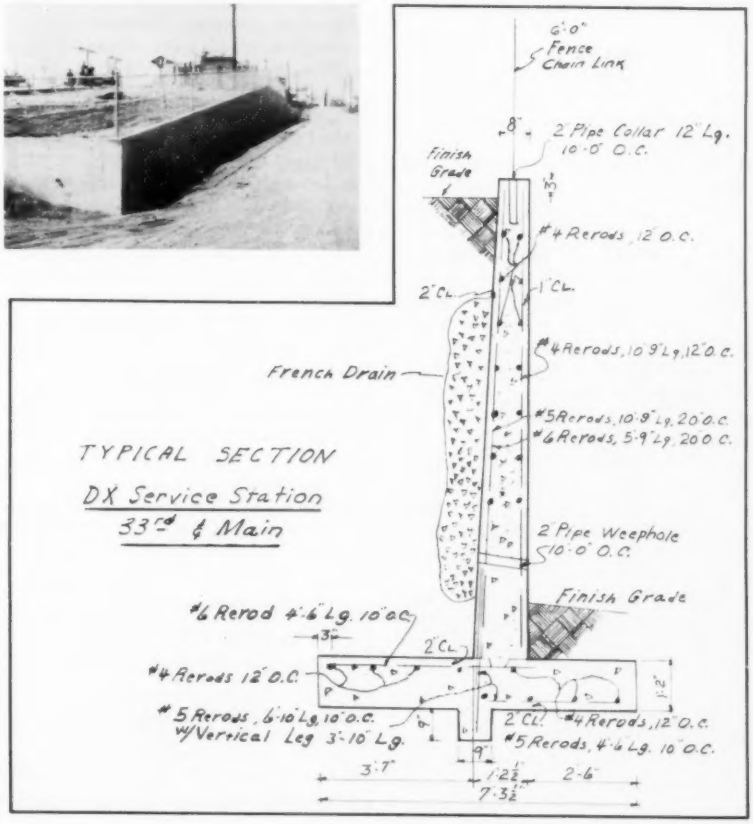
A wall approximately 200 feet long was constructed along South Main St. to utilize a wasted area for the building of a service station. It is a vertical reinforced concrete wall with a spread footing, varying in height from 6 ft. to 10 ft. 2-in. Pipe weep holes were installed at 10-ft. centers and a french drain built behind the wall. The cost of constructing this wall was $5,472, which included a pipe rail fence and an additional 41 ft. for a wing wall at the northwest corner of the property. The 6-ft. fence was built atop the wall for safety.

The second retaining wall was built at Stapleton School for safety protection and to permit the relocation of a dual lane highway. This wall is approximately 205 ft. long. It is vertical, of reinforced concrete with a spread footing, and varying in height. Also, a chain link fence was built atop this wall for the safety of the children. The construction cost of this wall was $14,209 which included the cost of the chain link fence.

The design of both walls was done by the City Engineering Department, under R. E. Crews, City Engineer.



● **VERTICAL reinforced concrete wall with spread footing protects schoolgrounds.**



● **DESIGN of wall 6 to 10 ft. in height to reclaim waste area for use.**

LINE STORAGE REDUCES
Storm Water Pump Sump Size

RAYMOND O. FOLLAND,
Director of Public Works and City Engineer, Albert Lea, Minnesota

IN THE heart of some of the richest farm land in the nation, and with a population of approximately 18,000, Albert Lea, Minn. is built around two lakes. Fountain Lake (sea level elevation 1215) was created originally for milling purposes by a dam on the Shellrock River near the center of the City. Albert Lea Lake (elevation 1210) was created below Fountain Lake by a second dam farther downstream.

The creation of these artifical lakes provides a beautiful setting for the City and much recreational benefits, but they also changed the surface drainage pattern of the entire area. This section of southern Minnesota is in a glaciated area characterized by rolling terrain varying in elevation from 1215 to 1300 feet above sea level. Interspersed among the hills are low areas which are at the approximate elevation of Fountain Lake. As the City expanded, it was inevitable that serious surface drainage problems were created in these lower areas.

In 1954, the City began a drainage survey of a developing area in the southeast section of the city. It was decided, at that time, also to investigate the possibility of correcting a drainage problem in an adjacent built up area which was being flooded repeatedly by surface water and which did not have a satisfactory outlet. The upper drainage area, of approximately 60 acres, was served by a storm sewer of inadequate capacity which drained by gravity to Albert Lea Lake. The lower drainage area, of approximately 160 acres, did not have any drainage facilities.

After surveys were completed, the possibility of a gravity relief sewer into the upper drainage area was considered. It became apparent that a gravity sewer was not feasible due to the relatively high elevation of Albert Lea Lake. The decision was then made to design a pumped storm sewer system for the upper area and to use a common trunk sewer for both areas to discharge into Albert Lea Lake. A plan was designed for the system to be pumped and the pumping station, known as the Virginia Place pumping station, was located. A preliminary plan was then designed which brought the upper end of the gravity trunk sewer to a point within six hundred feet from the lift station. The resulting grade of the trunk sewer proved excessively deep, and the plan was not considered feasible.

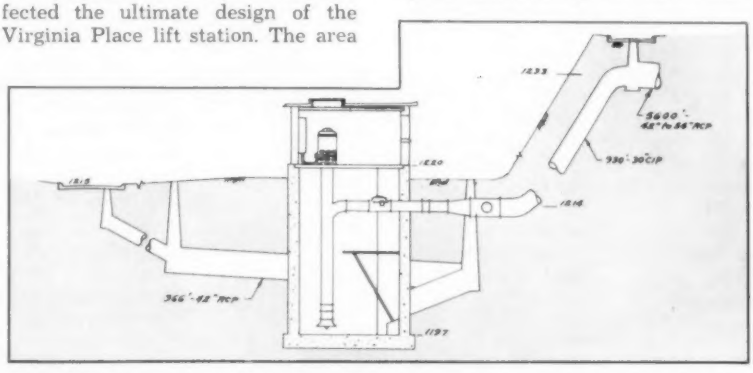
A second plan was then developed which terminated the trunk line 930 feet from the lift station at a higher elevation than the first plan. The additional lift provided the elevation needed to establish the grade of the trunk at a reasonable depth and to insure adequate velocities in the trunk sewer.

The next step was to determine the capacity to be provided and to design the sewer system and the pumping station. Rainfall curves were developed from data for this area as published by the U. S. Dept. of Agriculture. This rational method of storm sewer design was used based on a three year intensity-duration curve. The total capacity to be provided in the upper area was determined to be 52 cfs which averaged approximately 0.9 cfs per acre. The existing sewer was analyzed and its capacity was determined to be approximately 6 cfs. This left 46 cfs to be provided by the pumping facilities.

Design of Lift Station

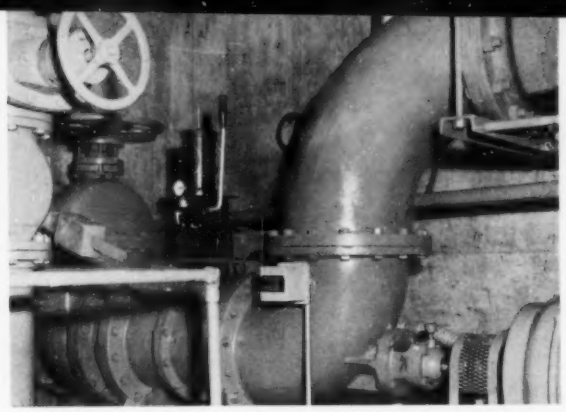
A number of considerations affected the ultimate design of the Virginia Place lift station. The area to be pumped was subject to flooding to considerable depth as indicated by previous high water, and this determined the elevation of the pump motors. It was decided to limit the pump drives to electric motors without standby power after consideration of additional cost, and possible flood damages in case of power failure. Consideration of type of pumps was the next item. The final design provided for two propeller pumps of a normal capacity of 10,400 gpm each pumping into a 30-in. cast iron pipe force main and operating against a normal head of 37 feet and a maximum head of 42 feet.

The two pumps are set in a reinforced concrete sump with motor and control housing. The pumps were controlled to start and stop automatically and to alternate automatically after each complete cycle. One of the most difficult problems was that of providing adequate sump volume in a limited area. This was accomplished by discharging the sub-mains into a 42-inch reinforced concrete main. The volume of the pumping station sump and 42-in. main between operating levels is approximately 36,000 gallons or 1.75 times the capacity of the lift station. The factor which determined minimum sump capacity was that of the limited number of starts and stops per hour which the pumping equipment could handle. The most critical incoming flow was determined to be about 15,600 gpm, and at this flow the high level pump cycles theoretically at about once



● **SECTION through Virginia Place lift station, with elevations and pipe sizes.**

● **INTERIOR** of Virginia Place lift station. There are two storm water pumps, each with 10,400 gpm normal capacity.



● **PIPING** arrangement at Fountain St. lift station. This underground station has a capacity of 10,600 gals. per min.

every 12 minutes. This cycle time is diminished, however, by the rise in water level at pump shut off due to surging in the incoming sewer. Ten cycles per hour by either pump was considered maximum in design of the system.

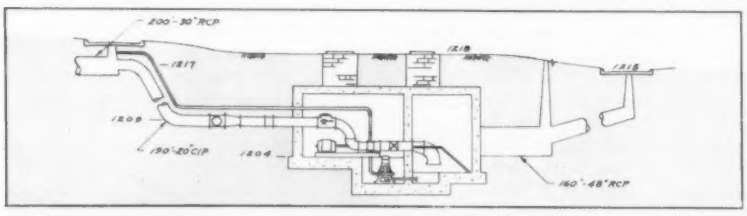
The relatively high total head also posed a problem. It was decided to use standard weighted swing check valves and these have performed very satisfactorily without water hammer. No gate valves were installed on the discharge line to insure against the pumps ever pumping against a shut-off head. Gate valves were also unnecessary since the 30-in. force main can be drained back into the lift and pumped out with a sump pump to old gravity storm sewer. The 42-in. line was laid in a soft clay and the bedding of the pipe was stabilized using about 2 to 3 feet of crushed rock under and around the bottom half of the pipe. The bottom half of the joints were left open and the sump has acted as a very effective under-drain for the low area.

The Virginia Place Lift discharges into a 42-in. reinforced concrete trunk sewer at a grade of 0.41 percent. This trunk sewer is about 5,600 ft. in length and enlarges gradually to accommodate additional drainage areas from 42 to 54 inches at the outfall of Albert Lea Lake.

The storm sewers and lift station were constructed in 1956. The pumping equipment at the Virginia Place Lift consists of two Fairbanks-Morse propeller pumps and one 3-hp Fairbanks-Morse turbine sump pump. Each propeller pump is a vertical, 18-in. 2-stage, axial flow pump powered by a 440-volt, 125-hp, 3-phase induction type motor. The three pumps are operated automatically by a float type Healy-Ruff Roto-Trol with automatic alternator for the two propeller pumps, and a Prime-Trol which automatically shuts off the pumps if they fail to deliver water. An alarm system is connected with the City Police Station.

Second Pumping Station

In 1957, the City constructed a second storm water pumping station known as the Fountain Street Lift. This station is an underground structure of 10,600 gpm capacity. The area draining into the Fountain Street Lift is about 26.5 acres. There is no existing sewer in the area and all storm water will be pumped. This Lift discharges into a 30-in. reinforced concrete outfall sewer at a grade of 0.50 percent. This is a relatively short outfall of 200 ft. due to the fact that the Lift is located near Fountain Lake. It was designed as an underground lift in the street right-of-way due to the size and terrain of the drainage basin. The hatch entrances are well above flood level in this case. The unit consists of a wet and dry pit designed throughout to minimize all danger of flooding the dry pit from any source. The sump size and lift capacity were designed on the basis of data similar to the Virginia Place Lift. This provides a capacity of about 0.9 cu. ft. per second per acre.



● **FOUNTAIN STREET** lift station handles storm water from an area of 26.5 acres.

The pumping equipment at the Fountain St. Lift consists of two Fairbanks-Morse propeller pumps and one Fairbanks-Morse vertical, 7½-hp close coupled 600-gpm trash pump for draining the 48-in. pipe sump. Each propeller pump is a horizontal, 16-in. single stage, axial flow pump powered by a 220-volt, 40-hp, 3-phase induction type motor. The three pumps are operated automatically by a switch type Consolidated Electric Co. control with automatic alternator for the two propeller pumps and flow switches which automatically shut off the pumps if they fail to deliver water. An alarm system is also connected with the City Police Station. This station operates against a normal total head of 19.5 feet and a maximum total head of 23 feet. Considerable saving was realized in being able to eliminate the pump house and necessary land for an above ground lift. The use of low head propeller pumps also represented the most economical pumping equipment for the purpose.

The City has completed plans for a third storm water pumping station which is proposed for construction in 1958. This unit will be very similar in capacity and design to the Virginia Place Lift. It is proposed, however, to install three 7,000-gpm pumps in this unit to increase flexibility and minimize reduction of capacity in case of pump shut down. Improvements in structural design are also provided to facilitate easier cleaning of the lift sump.

The Virginia Place station was constructed by the Acton Construction Co. of St. Paul, Minn., which was a subcontractor to McCree Co. of St. Paul, Minn., the prime contractor. The Fountain St. station was constructed by E. G. Greiman of Garner, Iowa. All design was done by the Engineering Division of the Department of Public Works of the City of Albert Lea under the direction of the author.

HOW TO SIZE SERVICES and METERS

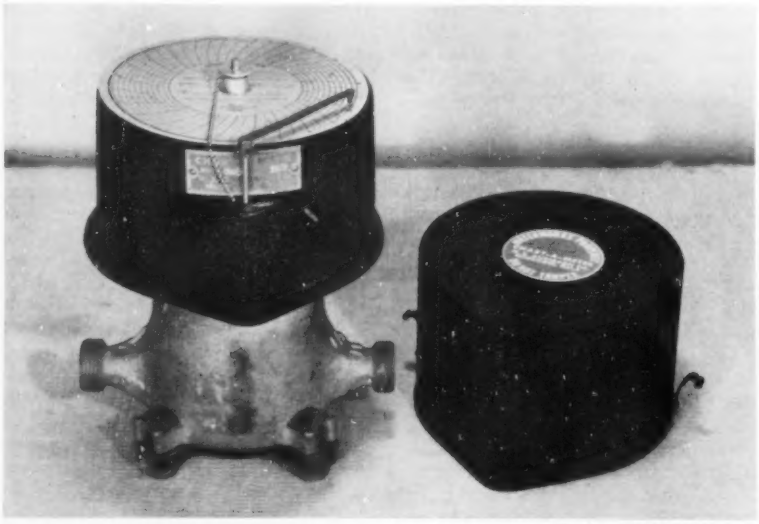
D. R. TAYLOR,
General Manager,
The Baton Rouge Water Works Company
Baton Rouge, Louisiana

IN KEEPING up with the gradual increase in total water consumption and maximum demand, a city may determine maximum demand without difficulty. The general use of recorders such as the Meter Master and the Chart-A-Meter has provided the utilities with a wealth of such information for all types of users. In addition, architects and consulting engineers are usually able to furnish the information desired for new commercial buildings.

The principal question, after the maximum demand is known, is what size service and meter is required. In this connection there seems to be some uncertainty in relating the maximum safe rate of a meter to the maximum demand. This should be of little concern so long as the maximum safe rate is not exceeded. The determining factor is the total monthly consumption. For continuous 24-hour daily or monthly service, meters of the displacement type should not be operated at flows greater than 20 percent of the maximum safe rate. It is recommended that the specifications described by James G. Carns, Jr.[1] be adopted.

One of the factors that has brought the question into prominence is the increasing popularity of underground lawn sprinkling systems for residential property. Some homeowners are hesitant to install such systems because of a reluctance to pay the minimum charge for a large meter during the winter months, when the sprinkling system is not in use.

In order to evaluate properly the problem of size, we constructed typical service and meter installations, to determine the capacities at several residual pressures, of various sizes and lengths. The installations consisted of type K copper tubing, Mueller corporation and curb stops the same size as the tubing, and Rockwell meters. Ford yokes were used for ⅝-in. and ¾-in. meters and standard connections for larger sizes.



Courtesy H. E. Anderson Co.

● **PROPER sizing of services and meters was determined for various conditions of use. CHART-A-METER, shown fitted on meter, provides much needed information.**

Due to unstable soil conditions in some sections of this area, the Company uses multiple parallel lengths of 1-in. copper tubing for 1½-in. and 2-in. services. Two or three parallel lengths are used for 1½-in. meters and two to four lengths for 2-in. meters, depending upon the length and maximum demand. For this reason, the tests and calculations were confined to these types of installations. When multiple lengths of tubing are used, they are joined by a tee, cross, branch connection, or header to the curb stop or valve at the inlet of the meter.

Lengths of 20, 40, 60 and 100 ft. were tested in the ¾-in. and 1-in. sizes and the results were plotted on logarithmic graph paper to determine capacities of other lengths. For services consisting of multiple lengths of copper tubing and for those consisting of 1½-in. and 2-in. galvanized steel pipe, the values were calculated and plotted on the same logarithmic paper to check their consistencies. Values obtained are shown in Tables 1 to 7. No values are shown which exceed the maximum safe rates recommended by the meter manufacturers. It will be noted that two parallel lengths of 1-in. copper tubing or one length of 1¼-in. copper tubing or 1¼-in. galvanized steel pipe, and a 1-in. meter will produce considerably more volume than one length of 1-in. copper tubing and yet retain the advantage of the minimum charge for the 1-in. meter. The pressure loss in 1¼-in. copper tubing ($C = 130$) and 1¼-in. galvanized steel pipe ($C = 100$) is practically identical, due to the difference in inside diameters.

As an example of the use of the tables, assume that for a property of moderate size, the maximum demand for a sprinkling system is 40 gpm at 35 psi, and it is desired to allow 6 to 8 gpm for normal household use, when the system is in operation. This means that 46 to 48 gpm will be required. Also assume that it has been determined that the static pressure in the main is 55 psi, and that the service is or will be 40 ft. long. By subtracting the residual pressure required (35 psi) from the static pressure in the main (55 psi) the result is 20 psi, which is the maximum pressure loss which can be allowed for the service and meter. It will be observed in Table 5 that for 40 ft. and a pressure loss of 20 psi, 49 gpm can be obtained with two parallel lengths of 1-in. copper tubing or one length of 1¼-in. copper tubing or 1¼-in. galvanized steel pipe and a 1-in. meter while satisfying all other requirements, whereas, one length of any type of 1-in. pipe would not do so.

Without such facts, a 1-in. service and meter may have been installed, resulting in the failure of the sprinkling system and in customer dissatisfaction or a 1½-in. service and meter may have been recom-

[1]Basis for Review of Meter Installations, *Jour. A.W.W. Ass'n.*, August, 1954.

Flow in GPM through Different Size Services and Meters At Varying Pressure Losses between Main and Meter Outlet

Table 1—¾-in. Copper Service, ⅝-in. Meter

Length,	Pressure Loss, psi			
ft.	10	15	20	25
5	15.7	19.5	...	...
10	14.5	18.0	...	...
20	12.8	16.0	18.2	...
30	11.7	14.5	16.6	19.0
40	10.8	13.5	15.6	17.7
50	10.2	12.8	14.5	16.7
60	9.6	12.0	14.0	15.8
70	9.0	11.2	13.2	15.0
80	8.5	10.6	12.6	14.0
90	8.1	10.0	11.9	13.3
100	7.6	9.5	11.0	12.5

Table 2—¾-in. Copper Service, ¾-in. Meter

Length,	Pressure Loss, psi			
ft.	10	15	20	25
5	18.8	23.5	27.0	...
10	17.2	21.5	25.0	28.3
20	14.5	18.0	21.2	24.0
30	12.8	15.7	18.0	20.8
40	11.5	14.2	16.7	19.0
50	10.5	13.0	15.2	17.2
60	9.8	12.2	14.7	16.0
70	9.1	11.6	13.4	15.2
80	8.6	10.8	12.7	14.6
90	8.2	10.2	12.1	13.9
100	7.8	9.8	11.5	13.2

Table 3—1-in. Copper Service, ¾-in. Meter

Length,	Pressure Loss, psi			
ft.	10	15	20	25
5	27.2	...	...	...
10	26.5	...	...	...
20	25.0	...	...	...
30	22.7	28.3	...	...
40	20.7	26.0	30.0	...
50	19.0	24.0	28.0	...
60	17.7	22.0	25.6	29.0
70	16.5	20.8	24.0	27.0
80	15.6	19.5	22.7	25.8
90	14.8	18.3	21.4	24.3
100	14.0	17.5	20.3	23.0

Table 4—Single Length of 1-in. Copper Service, 1-in. Meter

Length,	Pressure Loss, psi			
ft.	10	15	20	25
5	31.0	38.5	45.0	49.5
10	29.5	37.0	43.5	48.0
20	28.5	35.5	42.0	46.5
30	26.0	32.5	39.0	42.9
40	23.8	29.7	35.7	39.1
50	22.0	27.5	33.0	36.2
60	20.5	25.7	30.7	33.8
70	19.1	24.0	28.8	32.0
80	18.0	22.7	27.2	30.0
90	17.1	21.6	26.0	28.6
100	16.3	20.6	24.7	27.3

Table 5—Two Parallel Lengths of 1-in. Copper Service, 1-in. Meter[1]

Length,	Pressure Loss, psi			
ft.	10	15	20	25
5	42	...	...	...
10	41	...	...	...
20	39	48	...	...
30	36	44	...	...
40	34	42	49	...
50	32	39	46	...
60	31	38	45	50
70	30	37	43	48
80	29	36	42	47
90	28	34	40	45
100	27	33	39	44

Table 6a—2 Parallel Lengths of 1-in. Copper Service, 1½-in. Meter[2]

Length,	Pressure Loss, psi			
ft.	10	15	20	25
5	60	74	87	98
10	57	71	83	94
20	51	64	75	85
30	47	59	69	78
40	43	54	63	72
50	40	50	59	67
60	38	47	55	63
70	36	45	53	60
80	34	43	50	57
90	33	41	48	55
100	31	39	46	52

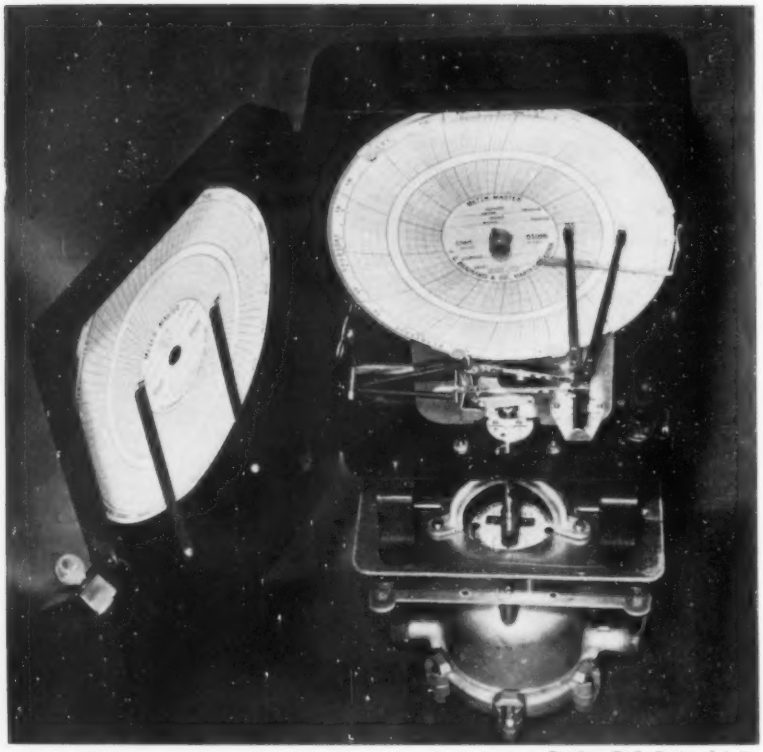
Table 6b—3 Parallel Lengths of 1-in. Copper Service, 1½-in. Meter

Length,	Pressure Loss, psi			
ft.	10	15	20	25
5	70	87	...	...
10	68	84	98	...
20	63	78	91	...
30	59	73	86	97
40	56	70	81	92
50	53	66	77	87
60	51	63	73	83
70	49	60	71	80
80	47	58	68	77
90	45	56	65	74
100	44	54	64	72

Table 7—Two, Three and Four Parallel Lengths of 1-in. Copper Service, 2-in. Meter[3]

	2 Lengths 1-in. Copper				3 Lengths 1-in. Copper				4 Lengths 1-in. Copper			
Length,	Pressure Loss, psi				Pressure Loss, psi				Pressure Loss, psi			
ft.	10	15	20	25	10	15	20	25	10	15	20	25
5	78	97	113	128	110	136	156	...	115	152	...	...
10	73	91	106	120	98	122	143	160	106	144	...	...
20	63	78	91	103	86	108	126	142	103	128	150	...
30	56	70	81	92	78	97	113	128	95	118	138	156
40	50	62	73	82	71	88	103	116	89	111	129	146
50	46	58	67	76	66	82	96	108	83	103	120	136
60	43	53	62	70	62	77	89	101	77	96	112	127
70	40	50	58	66	58	72	84	95	74	92	107	121
80	38	47	55	62	55	68	80	90	70	87	102	115
90	36	45	52	59	52	65	76	86	67	83	97	110
100	35	43	50	57	50	62	73	82	65	80	94	106

[1] These values may be also used if service consists of one length of 1¼-in. copper tubing or 1¼-in. galvanized steel pipe and 1-in. meter.
[2] If 1½-in. service consists of one length of 1½-in. galvanized steel pipe, use values for two lengths of 1-in. copper.
[3] If 2-in. service consists of one length of 2-in. galvanized steel pipe, use values for four lengths of 1-in. copper.



Courtesy F. S. Brainard & Co.

● **VARIOUS sizes and lengths of line were tested at residual pressures indicated in the text, using the Meter Master, to determine service pipe and meter sizings.**

mended, resulting in the abandonment of the proposed project. As it turns out, the customer may be appreciative of the utility's assistance and pleased that he can irrigate as much as he wishes, during some seven or eight months of the year and yet not have to pay a high minimum charge during the other months. Furthermore, this little additional practice of public relations may gradually create satisfaction among more larger users, adding to the annual revenue of the utility.

On the other hand, for similar or different requirements, services and meters of excess size may be installed, with the attendant extra costs, if necessary information is not available. As an example of what can happen, the Company conducted a survey during the past year, of some 400 meters larger than 1-in., with two Meter Masters and two Chart-A-Meters. The survey revealed that 107 meters were oversize, 2 undersize and 14 were of the wrong type. One 6-in. meter was replaced with a 3-in. meter; one 4-in. with 2-in.; one 4-in. with 1½-in.; one 3-in. with 2-in.; forty-one 2-in. with 1½-in.; sixteen 2-in. with 1-in.; forty-seven 1½-in. with 1-in.; and one 1½-in. with ⅝-in.

Checking Now Routine

Now, all new installations larger than 1-in. are checked with a recorder, after normal use is established, to prevent the recurrence of such a condition. The combined registration of the 400 meters was approximately 100 mg per month. It is not difficult to imagine the large quantity represented by the combined low rates of flow during the night that was not registered by the oversize meters. Much of this could have been prevented, during the past many years, if present-day information had been available.

It is recommended that the superintendent of the utility encourage consulting engineers and designers to consult him as often as necessary. He can be very helpful and may point out conditions peculiar to the area in question, of which the engineer is unaware. Such consultation will be mutually beneficial.

WHAT WATER SHORTAGE

ROY R. ROBINSON,
City Manager,
Kinston, N. C.

THE DEVELOPMENT of our particular source of water supply is largely due to the foresight of the then Mayor in 1904. During the early years of the century water supply was no problem. Many flowing wells were located about the City and anyone could obtain water by digging or by sinking a pipe to be equipped with a hand pump. That these water sources were close to outdoor privies and that the incidence of water borne disease was high was of no consequence. All early sanitarians faced this problem.

Kinston's first water system was installed in 1900 and consisted of a steam pump delivering water to a few blocks of pipe from driven wells about twenty feet deep. Eleven fire hydrants were provided and some fifteen customers purchased water. In 1903 the citizens voted favorably on a bond issue of $150,000 to provide a series of public improvements such as water, electric lights, sewers

and some paving. A consultant was retained. Apparently an argument immediately took place about his recommendation for an impounding reservoir as a source of water. The Neuse River flows past the west boundary of the City and many people were of the opinion that this was the logical source for a water supply.

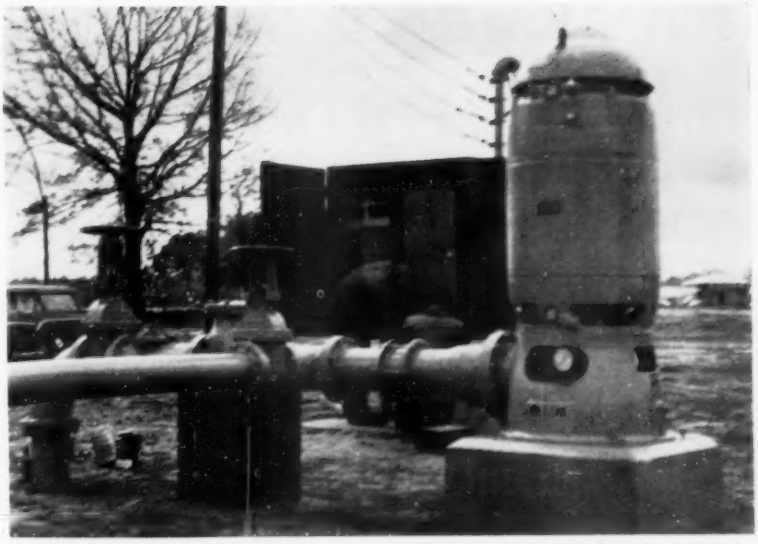
Quoting from a story of the proceedings, "These deep water men argued that surface water would not do for various reasons and that river water would not be much better and would require an expensive treatment plant. The surface water men claimed it was a risky thing to take several thousand dollars of public money and sink it in the ground in the hope of finding deep water when expert opinion had advised against that course. The Mayor was determined to do this very thing and his faith was rewarded at the first attempt by finding an abundant supply of excellent water."

The three original wells were 10-inch, flowing into a 350,000-gallon reservoir from which the water was pumped to a standpipe. These wells were later equipped for air lift. An analysis of the water at the time proved it to be soft and potable and matches present day standards.

During the years through 1926 various artesian sources were developed, but the City was growing and the demand exceeded the supply. It was decided at this time to sink some wells of the gravel wall type. The first of these was 365 feet deep, yielding 860 gpm. It is notable that this well was rehabilitated in 1952 to yield 1,000 gpm. The year 1937 saw an additional well developed and the underground storage enlarged to 1.5 mg. This same year property was purchased and an overhead tank of 500,000 gallons capacity erected with a well close by.

As demand increased, wells were developed in 1953 and 1955, one each on the east and west sides of the City. These five wells supply a total of 5,000 gpm. Our planning indicated the need for an additional well and overhead tank to the north. In 1957 bids were let for the improvement. The well was completed in January 1958 and test pumped 1,500 gpm.

Underground sources of water in North Carolina are practically unknown for municipal supply. Ample surface water is available, but underground supply in quantity is only to be had in a rather narrow section of the State. This aquifer stretches in a general north east direction across the States of Georgia, North and South Carolina into Virginia.



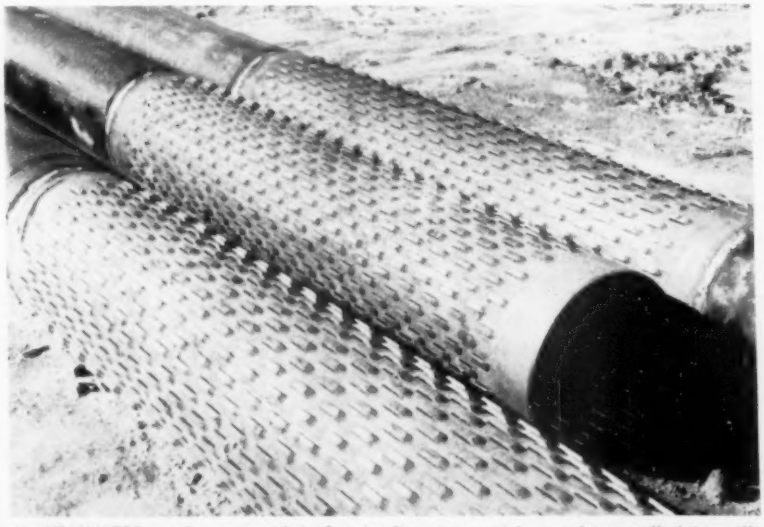
● **WELL No. 7 was completed for Kinston last winter. About 445 ft. deep, the well pumped to the atmosphere at 1500 gpm under test. Water is of good quality.**

The water-yielding sands are not uniform in either thickness or depth even around the perimeter of Kinston. Well depths range from 350 to 500 feet. Water for Kinston is taken from varying depths. Water enters the formation generally from the west and trickles down and through to areas where it is removed. Strata about the Kinston area yield the best and most water; wells toward the coast encounter sulfides and salt, and the water is corrosive, hard, and contains iron.

The Kinston water supply is pumped directly to the system without treatment. The range of hardness is 11 to 35 mg/L; iron content, 0.19 to 0.27 mg/L. We are exceedingly fortunate in having natural fluorides between 0.07 and 0.7 mg/L. Some areas toward the Virginia border show fluoride in concentrations that can cause tooth mottling.

Since there are no large cities or industries across our section of the State we feel that our water is unlimited. The State Geologists believe the source could be utilized to a far greater extent without damage. Wet and dry seasons do affect the static level, and pumps must be set to allow for this variation.

Kinston pumps between 80 and 100 mg per month; we have no large individual users. A State training school and the DuPont Dacron plant nearby have their own wells but these seem to have no effect on our supply.



● **STAINLESS steel screen, 10 inches in diameter, waiting to be installed in well.**

PAVEMENT MARKINGS

Improve Traffic Flow

HENRY M. DeNOBLE,
Traffic Engineer,
Little Rock, Arkansas
formerly
Director, Traffic and Planning
Springfield, Missouri

THREE YEARS ago the streets of Springfield, Mo., were virtually barren of any pavement markings. Today, if you travel the streets of Springfield, you will be guided by center lines, lane lines and channelization lines at intersections. Even the parking stalls are clearly marked by visible white lines. All of this was made possible by an increased budget account for paint and paint supplies for the Planning and Traffic Department.

At the start of the Traffic Department in Springfield in 1955, there was no money available for a street striping program. Since that time, the traffic budget has been increased upward from nothing to $83,938, this past year's total. This budget provided sufficient funds to hire the personnel and to buy the equipment and paint to carry out a paint striping program. The Sign and Paint Division of the Traffic Department is broken up into three working crews. Each work crew is headed by one regular employee of the department and is aided by a complement of from 1 to 4 prisoners from the city jail. The prisoners take advantage of this opportunity to work in order to shorten their imprisonment time. Each of the three crews is responsible for a different function of the striping program; that is, one for cone setting, one lane line, and the other paint supply and laying of the guide lines.

Applying the Paint

To apply the paint lines to the streets a Model B3P Kelly-Creswell striping machine is used. A special trailer built by the department is used to transport this machine from location to location. The actual painting of the lines is done in the following manner. The first crew measures and sets markers indicating the location of the paint line. A guide line is stretched so that the operator can follow this line in laying the paint. The crew that marks the line to be painted attempts to stay one block ahead of the paint machine. After the paint machine has passed, one of the department's vehicles follows, carrying additional paint and accessory equipment that is needed; and at that time sets the traffic cones in position to protect the newly painted line. Where the center line and lane lines are already in existence, the process is much faster, since guides are already in place. In repainting of existing lines, only two crews are used; that is, the paint crew applying the line and the truck crew in setting the cones on the freshly painted line and carrying additional supplies needed.

At present a total of 85 miles of center and lane lines have been established on our streets since the department was initiated. Over 1,750 gallons of white reflectorized paint and over 625 gallons of yellow reflectorized paint have been used to the end of the fiscal year, June 30, 1958. Provided the requested 58-59 budget is approved, an additional 27 miles of center and lane lines will be applied. In addition to the 27 miles, all of the existing lines will be repainted. Approximately 1,000 gallons of paint will be used in this coming year at a cost estimated at $3,856 for paint and $730 for labor, for a total of $4,586.

This program includes the maintenance and establishing of directional arrows and the painting of parking stalls both on the street and in the four municipal off-street parking lots. Under the present arrangement, the center lines are painted yellow and the lane lines a solid white. Just prior to this change, the center lines were solid white and the lane lines a dashed white. This new system is being used to familiarize the public with lane driving in the hopes that motorists will pay more attention to the lines on the street and will drive between them rather than straddling them. On some streets where this test was made previously, it was found that motorists adhered to driving within the lane much better where a yellow center line was used. Eventually it is planned to return to the standard white center line and the broken white lane lines.

In selecting the paint to be used, specifications are written and bids called for on pre-mixed white and yellow reflectorized traffic paint. Each company that bids is requested to submit a sample of the actual paint that they intend to furnish if the bid is awarded to their company. Upon receiving the sample of paint, it is applied to a test line area on the city streets where the paint is tested under actual conditions of traffic. Before a company is selected to furnish the paint, the actual test line performance is used to determine the best paint. All paint furnished to the City must come in 5-gallon drums to make handling easier. In using the Kelly-Creswell Model B3P paint striping machine, we have been averaging 600 feet of paint line per gallon of paint. In the three years of the program, we have used both yellow and white reflectorized traffic paint manufactured by the Prismo Company and the Minnesota Mining and Manufacturing Company.

● **DIRECTIONAL** arrows are painted on the street. On traffic lining, a gallon of paint covers about 600 ft. of line. Paint is tested and bought on specifications.

Courtesy Dorr-Oliver, Inc.

● **RESTAURANT and service area on Pennsylvania Turnpike has population equivalent of 3000, is served by 30-ft. Duo-Clarigester and 38-ft. diameter Duo-Filter providing a high degree of treatment.**

SMALL SEWAGE TREATMENT PLANTS—*SLUDGE DIGESTION*

JOHN J. BAFFA
Consulting Engineer,
New York City

SLUDGE DIGESTION FACILITIES represent major components of small sewage treatment works. The treatment and disposal of the solids fraction of domestic sewage is affected from the design standpoint, by the type of treatment afforded the liquid fraction and in turn may affect the choice and design of overall treatment process. Anaerobic and aerobic digestion of sewage solids are practiced currently in the small treatment plant field. Anaerobic digestion may be accomplished in septic tanks or in the digestion compartment of two story tanks or in separate sludge digestion tanks. Aerobic digestion with reference to sludge solids has been in use in recent years for small plants. This type of solids digestion is based upon the concept of the oxidation of bacterial cells by their own metabolism and is carried out as a part of processes of sewage treatment employing aeration. By employing long term aeration, ash solids are discharged in the effluent or may be held for separate disposal. Sludge disposal facilities also affect digestion design. Sludge disposal facilities for small plants may be provided for either raw or digested sludge. These facilities in the lower capacity range for small plants may include the use of lagoons or sludge drying beds, and in the higher capacity range may include dewatering with vacuum filters with or without subsequent heat drying or incineration.

Small Plant Problems

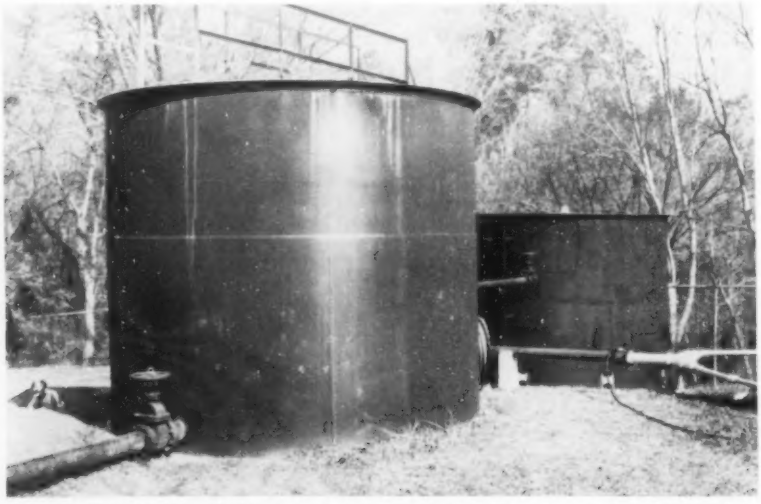
Sludge digestion design seeks to secure a maximum oxidation of organic solids by means of biological action. Therefore, sewage quality is important from the standpoint of organic solids present, and the presence of any interfering substances such as might be present in industrial wastes. The domestic sewage from industrial and commercial establishments will usually contain only about one third the per capita solids content of sewage from housing projects or small municipalities. Therefore, two story tanks with shallow digestion compartments find frequent application here. Digestion compartments should be calculated to conform to actual solids load, since the per capita values used for municipal conditions are meaningless in such cases. The volatile content of sewage from restaurants will be high due to grease content. In recent small plant practice, it has been found advantageous under these circumstances to pass the entire sewage flow through the digestion tank in order to break down anaerobically the grease solids prior to application of the flow onto trickling filters. There is also some evidence that synthetic detergents will not interfere with the anaerobic process. Camp and resort sewages have a high volatile content, which affect calculation of digester sizes.

In recent years, new housing projects are being built with garbage grinders in a large percentage of the houses. Also an appreciable number of garbage grinders are being installed in small residential communities. Garbage grinders increase solids loads thus requiring more digestion space. The effect of industrial wastes may be a major consideration for small municipalities where one industry such as a laundry or a canning plant is present.

Temperature environment requirements are important and affect required capacity in that heated digestion can be accomplished with less tank volume. This fact can be used to advantage for small plants serving housing projects. For the most part, land subdivision developers have to keep initial investments small even though future

possibilities may involve serving large populations. It has been found effective to provide facilities in the initial construction so that future digester heating is possible and thereby provide for considerable future capacity increase although using the same structure for both initial and future conditions. On the other hand, digester heating may be eliminated entirely for plants that operate seasonally such as for summer resorts and camps because summer temperatures are favorable to digestion. Maintenance costs would thus be reduced.

Operating labor with mechanical ability and sewage treatment know-how will usually be available for some plants serving industrial establishments and municipalities. Camps, summer resorts, private restaurants and housing projects may not have adequate operating labor available. Where this is apparent, simple and fool-proof digester design is important in order to eliminate the possibility of explosion and the need for preventive or continuing maintenance. Gas utilization from the economic and operating standpoints is most desirable and effective for institutional, municipal and large housing projects; and possibly for large industrial situations; but is not desirable for camps, summer resorts, commercial establishments and the smaller industrial plants.



● **METAL Imhoff tank foreground; in rear is the filter (on top) and secondary settling tank (beneath). Plant serves 230 persons in a restricted subdivision area.**

Size Requirements

The volume required for anaerobic sludge digestion should be sufficient to hold the raw sludge added during the digestion period minus the volumetric loss resulting from digestion and plus the volume of digested sludge which accumulates between withdrawals thereof. The digestion period for heated tanks maintained at 90° F. is 30 days, but is 60 days for unheated tanks where climatic conditions are such that sludge temperature will be maintained at 50° F. For colder climates, volume must be provided for undigested sludge for the period that low temperatures will prevail. The volume loss during digestion is periodically removed as supernatant water. Length of time between digested sludge withdrawals depends upon the method of sludge drying and disposal which is employed. Thus, where vacuum filters or heat drying is employed, digested sludge may be removed daily or weekly. Where sludge drying beds are used, 90 days of storage for digested sludge should be provided in the digestion tank volume. This provides for periods when weather does not permit air drying.

In calculating digester volume, it is customary to figure that about 60 to 75 percent of the volatile portion of the raw sludge dry solids will be destroyed by digestion. Digested sludge ready for withdrawal will contain the inorganic solids originally present in the raw sludge plus the undigested portion of the volatile solids. This residue is about one half of the total raw sludge solids and is usually withdrawn at 10 percent moisture. Volume allowances for scum and supernatant storage may be 2 to 3 feet of tank depth. Raw sludge moisture will vary with the treatment process and has considerable effect on digester volume calculations.

Operating experience with municipal installations has given rise to the use of per capita volume values which form the basis for many state regulations. In addition to giving a range of per capita volumes for designer guidance, Florida, Colorado, Idaho, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, South Dakota, Texas, Wisconsin, Wyoming and Utah allow the digestion tank capacity to be calculated by the designing engineer when the composition of the sewage has been established so that computations can be made based upon the volume and character of sludge to be digested.

Of interest are the requirements of various states for the volume of Imhoff tank digester compartments. Connecticut requires 4.0 cu. ft. per capita and where humus sludge is present, 1.5 cu. ft. per capita additional. Colorado requires 3 cu. ft. per capita for heated and 4 cu. ft. for unheated tanks. Idaho requires 3 cu. ft. per person for primary sludge and 4 cu. ft. for primary plus trickling filter humus. Missouri requires 3 cu. ft. per capita and for temporary sewage works 2 cu. ft. per capita if provision is made to remove the wet sludge. New Jersey requires 3 cu. ft. per capita for separate systems and 4 cu. ft. per capita for combined systems. Additional allowance is required for humus sludge. North Carolina requires 3 cu. ft. per capita for primary sludge only and 4 cu. ft. per capita if secondary sludge is returned. Wyoming requires 5 to 6 cu. ft. per capita. South Dakota and Utah require 3 to 4 cu. ft. per capita for unheated tanks and 4 to 5 cu. ft. per capita when filter humus is returned. Texas requires 2.5 cu. ft. per capita for primary sludge and 3.5 cu. ft. per capita with filter humus. The Ten State Rules require 3 to 4 cu. ft. per capita for unheated tanks and 4 to 5 cu. ft. per capita with trickling filter humus. Most states specify the limits within the digestion compartment which can be calculated as sludge storage. Many states require that the top of the sludge zone be taken as a plane 18 inches below the slots. The "Ten State Standards*" say, "The volume of the sludge compartments should be calculated as

*"Ten State Standards for Sewage Works," issued by the Joint Committee of the Upper Mississippi River Board of Public Health Engineers and Great Lakes Board of Public Health Engineers.

a space below a horizontal plane at the point of maximum overlap of the slot in the bottom of the settling chamber and planes having a slope of 30° from the horizontal upward from the end of the sludge withdrawal pipe to the point of intersection with the vertical walls." This provision is to allow for the dead space resulting from caking of sludge near the walls of the tank.

For both Imhoff tanks and separate sludge digestion tanks, where a range of per capita values are given, the "Ten State Standards" and the regulations of Florida, Colorado, Idaho, Illinois, Wyoming, South Dakota and Utah say the following: "For small installations (population 5000 or less) consideration should be given to using the larger values. Additional capacity shall be provided where garbage solids are anticipated." Florida instructions indicate that the reason for higher per capita values for small treatment plants is that less control over digester operation is exercised in small plants. In regard to garbage solids. Kansas policy is to require 100 percent greater digester volume where all the community garbage is discharged to the sewer system than is required for domestic sewage alone.

The per capita volumes required by the various states for separate sludge digestion are shown in Table 1.

Design Details

Design details for Imhoff tanks have been previously discussed in the article of this series "Sedimentation" (PUBLIC WORKS, February, 1958). The design details recommended by the "Ten State Standards" are representative of best digester design practices. These include: Multiple digestion tanks are recommended. Where this is not practical, it is desirable to have a lagoon or open tank for emergency use so that the digester can be taken out of service without unduly interrupting plant operation. The proportion of depth to diameter should be such as to allow for the formation of a reasonable depth of supernatant liquor.

Maintenance Provisions: To facilitate emptying, cleaning, and maintenance, the following features are desirable: The digester bottom should slope to drain toward the withdrawal pipe. At least two access manholes should be provided in the top of the digester in addition to the gas dome. One opening should preferably be large enough to permit the use of mechanical equipment to remove grit and sand. A separate side wall manhole is worthy of consideration. Nonsparking tools, rubber soled shoes, safety harness, gas detectors for inflammable and toxic gases, and gas masks of the hose or oxygen helmet type should be provided for safety. Provision should be made for the recirculation of sludge. One inlet should discharge above the liquid level and be located at approximately the center of the tank unless mechanical scum breakers are employed. The raw sludge inlet line should discharge at a point at least the radius of the digester from the supernatant draw-offs.

Sludge Pumps: Pump capacities should be adequate but not excessive. Provision for varying pump capacity is desirable. Duplicate units shall be provided where failure of one unit would seriously hamper plant operation. Plunger pumps or screw feed pumps should be provided for handling raw sludge. A minimum positive head of 24 inches shall be provided at the suction side of centrifugal type pumps and is desirable for all types of sludge pumps. Maximum suction lifts should not exceed 10 feet. Unless sludge sampling facilities are otherwise provided, quick closing sampling valves should be in-

TABLE 1—DIGESTER CAPACITY REQUIREMENTS

as Given by Various State Regulations

CUBIC FEET PER CAPITA										
STATE	PS		CP		SRF		HRF		AS	
	H	UH	H	UH	H	UH	H	UH	H	UH
FLORIDA(a)	—	2 TO 3	—	3.5 TO 4.5	—	3 TO 4	—	3 TO 4	—	4.5 TO 5.5
CONNECTICUT	—	4.0 MIN.	—	—	—	—	—	—	—	5.0 MIN.
COLORADO	3	4	—	—	4	6	5	8	6	—
IDAHO	2 TO 3	4 TO 6	—	—	3 TO 4	6 TO 8	4 TO 5	8 TO 10	4 TO 6	8 TO 12
ILLINOIS	2 TO 3	4 TO 6	—	—	3 TO 4	6 TO 8	4 TO 5	8 TO 10	4 TO 6	8 TO 12
KANSAS	—	—	—	—	3.0(b) MIN.	6.0	—	—	—	—
NEW JERSEY	2 TO 3	4 TO 6	4 TO 5	6 TO 8	2.5 TO 3.0	4 TO 6	3 TO 4	5 TO 7	4 TO 6	8 TO 10
"TEN STATE RULES" ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, NEW YORK, OHIO, PENN., WISCONSON	2 TO 3	4 TO 6	—	—	3 TO 4	6 TO 8	4 TO 5	8 TO 10	4 TO 6	8 TO 12
NORTH CAROLINA	2 TO 5	3	—	—	3	4	—	—	4.5	6
WYOMING	2 TO 3	4 TO 6	—	—	3 TO 4	6 TO 8	4 TO 5	8 TO 10	4 TO 6	8 TO 12
SOUTH DAKOTA	2 TO 3	4 TO 6	—	—	3 TO 4	6 TO 8	4 TO 5	8 TO 10	4 TO 6	8 TO 12
TEXAS	2.5	—	—	—	3	—	3 TO 4(c)	—	5.0	—
UTAH	2 TO 3	4 TO 6	—	—	3 TO 4	6 TO 8	4 TO 5	8 TO 10	4 TO 6	8 TO 12

KEY FOR COLUMN HEADINGS: H=Heated; UH=Unheated; PS=Plain Sedimentation; CP=Chemical Precipitation; SRF=Standard Rate Filter; HRF=High Rate Filter; AS=Activated Sludge

NOTES: (a) Values may be reduced for heated tanks. (b) For air drying of sludge. (c) Also for Contact Aeration sludge.

stalled at the sludge pumps. The size of the valves and piping should be at least 1 1/2 inches.

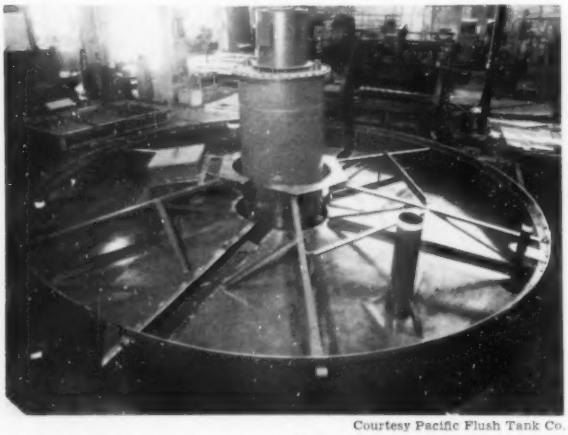
Sludge Piping: Sludge withdrawal piping should have a minimum diameter of eight inches for gravity withdrawal and six inches for suction. Sludge pump discharge piping should be at least four inches in diameter. Where withdrawal is by gravity, the available head on the discharge pipe should be at least four feet and preferably more. Gravity piping should be laid on uniform grade and alinement. Slope on gravity discharge piping should not be less than 3 percent. Provision should be made for draining and flushing discharge lines. Supernatant piping should not be less than six inches in diameter.

able or other conditions make it advisable not to return it to the plant. In large plants consideration should be given to supernatant conditioning.

Florida does not approve fixed covers; floating covers are preferred. Open digesters may be used in remote locations where there is no possibility of odor nuisance. Floating covers must include a position indicator so that the cover position may be checked readily at all times. Single sludge pumps are permitted in small installations where temporary failures of the single unit would not handicap plant operation.

Connecticut states that because of the many designs possible with modern digester layouts and the

withdrawal, the gas will be maintained under pressure. All points where any gas leakage might conceivably occur should be adequately ventilated and separated from areas where extraneous sparks, fires, or lights might occur. All necessary safety facilities should be incorporated where gas is produced. Pressure and vacuum relief valves and flame traps are essential. Water seal equipment should not be installed. Gas piping should be at least 2½ inches in diameter and should slope to condensation traps at low points. The use of float controlled condensate traps is not permitted. Gas burning boilers, engines, etc., should be located at ground level and in well ventilated rooms. Gas lines to these units shall



Courtesy Pacific Flush Tank Co.

● **SMALL digesters can be well-built too. Floating cover is being assembled in shop and will be shipped in two pieces.**

Courtesy Dorr-Oliver Inc.

● **LABORATORY wastes are treated in this plant. Design population 600; flows, 40,000 gpd average, 120,000 peak.**

Withdrawal Arrangements: Piping should be arranged so that withdrawal can be made from three or more levels in the tank. A positive unvalved overflow shall be provided. On fixed cover digesters the supernatant withdrawal level should preferably be selected by means of interchangeable extensions at the discharge end of the piping. If a supernatant selector is provided, provision shall be made for at least one other draw-off level located in the supernatant zone of the tank, in addition to the unvalved emergency supernatant draw-off pipe. High pressure backwash facilities shall be provided. Provision should be made for sampling at each supernatant draw-off level. Sampling pipes should be at least 1 1/2 inches in diameter.

An emergency disposal method for the supernatant liquor in the form of a lagoon or an additional sand bed should be provided for use in case supernatant is not suitmany appurtenances in use, designers are urged to present the general preliminary layout to the State Department of Health well in advance of the preparation of the final drawings.

Kansas states that in view of the increased solids load being caused by garbage grinders, the trend to external heat exchangers and recirculation of sludge within digesters, all designs for separate sludge digesters should be based upon two stage digesters.

Heating

The "Ten States Standards" again embody good design practice for heating and sludge gas utilization as follows:

"Gas Collection, Piping, and Appurtenances: All portions of the gas system including the space above the digester liquor, storage facilities and piping should be so designed that under all normal operating conditions, including sludge

be provided with suitable flame traps.

"Electrical fixtures in enclosed places where gas may accumulate shall comply with the National Board of Fire Underwriters specifications for hazardous conditions. Waste gas burners should be located at least 25 feet away from any plant structure if placed at ground level, or may be located on the roof of the control building if sufficiently removed from the digesters. In remote locations, it may be permissible to discharge the gas to the atmosphere through a return bend screened vent terminating at least ten feet above the walking surface provided the assembly incorporates a flame trap. A gas meter with bypass should be provided. Any underground enclosures connecting with digesters or containing sludge or gas piping or equipment shall be provided with forced ventilation which should be in operation, pref-

(*Continued on page* 150)

● WATER Works building at Hammond, Ind. Plant is unusual in that all chemicals are introduced in a liquid state.

The CITY of HAMMOND

—in Step with Waterworks Progress and Prepared for the FUTURE

D. L. GALLAGHER,
Manager, Public Works Dept., Worthington Corp.

INCORPORATED as a City in 1884, Hammond, Ind., took over operation of the city water works in 1891 and erected its first pumping station off the shores of Lake Michigan. After the turn of the century the rapid development of Hammond's industries and steady increase in population created a demand for more water. In 1904, a new 30-inch intake was laid extending 2,100 feet into the lake. This structure, along with an existing 24-inch intake extending 1,400 feet, satisfied the City's water requirements until 1921 when the first high lift pumping station was planned, and this went into operation in 1923.

The original pumping units in this new station were two Worthington cross-compound crank and flywheel steam pumps. Each had a rated capacity of 15 mgd at a head of 231 ft. Steam was supplied by a 300-hp water tube boiler. One of these pumps was moved from another station where it was originally installed in 1911.

For nearly 20 years these two steam pumps (plus a single stage 500-hp motor driven centrifugal pump with a capacity of 15 mgd at 145-ft. head added in 1926 as an emergency unit) served Hammond as well as the neighboring towns of Lansing, Munster and Highland. In 1941, a fourth unit was installed to provide sufficient pumping and reserve capacity during high summer load periods. The unit, a single stage centrifugal pump connected to a 700-hp electrical motor, had a capacity of 20 mgd when operating against a head of 155 feet.

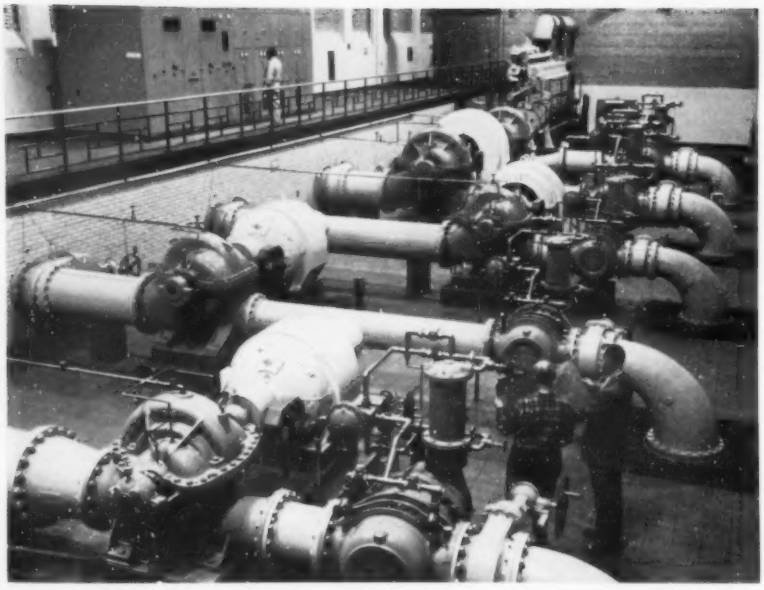
Intake Works

Lake Michigan constitutes one of the world's best natural sources of water supply, but, unfortunately, it has also proved convenient for the disposal of sewage and industrial wastes. For over sixty years Hammond has used the Lake Michigan source, and for many years the City consumed water which was frequently turbid and often unpalatable. In 1933, Federal funds were allocated for the construction of a filtration plant. Work was begun in 1934 and the plant went into service in 1936.

The raw water supply is taken from a pocket in the Lake formed by two steel and stone breakwaters, providing a gap about three miles long and forming the only outlet to the open lake. Located in this gap is the intake structure. Built in 1928 at a depth of about 18 feet, this structure consists of a rock filled timber crib constructed of timber piles driven into the bed of the lake.

The raw water is taken from this crib, which is located about one mile from the shore, and from two smaller intake structures. From the intakes it flows by gravity into a shore well. Made of reinforced concrete, the well is 70 ft. in diameter and 20 ft. deep and has a capacity of 0.5 mg. The water, as it enters the well, is imparted a circular motion by passing through circular screens. Now used as a primary settling basin, this well constituted the entire water treatment plant when built in the early 1920's.

Four low lift pumps, housed in a large pump room integrated within the plant, take suction from the shore well and lift the incoming water into a raw water flume. There are four centrifugal pumps having



● **HIGH-LIFT pumping equipment. New wing, shown in picture on preceding page, houses five volute centrifugal pumps having a total capacity of 116 mgd at heads of 140 to 196 ft. Four pumps are motor driven; one is powered by dual-fuel engine.**

an aggregate capacity of 72 mgd, and all electrically driven by synchronous motors. The pumps may be started or stopped from either the floor of the pump room or from a control board located on a balcony above.

Chemical Feed

The raw water is chemically treated as it travels in the flume through the chemical feed room. The flume is open to facilitate convenient inspection of the water and enable the operator to detect quickly any changes in the quality of the raw water as well as providing for visual inspection of the introduction of the chemicals.

Hammond's filtration plant is especially unique in the fact that all chemicals for treating the raw water are introduced in a liquid state. The principal coagulant now in use is liquid aluminum sulfate, fed either into the raw water flume or into the outlet conduit to the easterly sedimentation basin for double coagulation.

For taste and odor control, activated carbon is mixed with water in an underground tank into a slurry composed of one pound to one gallon. From the mixing tank the slurry is transferred into a subterranean storage tank where the carbon is kept in suspension by constant stirring. Control of the amount of carbon being fed into the raw water is varied by remote pneumatic control which changes the variable sheave pulleys on the positive displacement chemical feed pumps.

The carbon is pumped into a raw water flume, the outlet conduit (when the plant is being operated on double coagulation), into reaction basins for split feeding, or to the settled water collector for treating the water just before it passes onto the filters. This plant has been one of the pioneers in the large scale use of carbon for taste and odor control.

Chlorine and ammonia may be fed either to the raw water ahead of the raw water flume, to the filtered water collector, or to each third mixing chamber. The feeding arrangement can permit the carbon to remove the phenol before the introduction of the chlorine and ammonia.

By receiving the chlorine in one-ton containers it is possible to store them adjacent to the chlorine feed room so they may be handled with a minimum amount of labor and risk. Ammonia is received in bulk and is pumped into a 5,500-gallon storage tank.

As a safety precaution, separate rooms for feeding chlorine and ammonia are provided. In the event of gas leaks these rooms can be sealed off from the rest of the plant and ventilated by large exhaust fans controlled from the outside. Shades have also been provided for the the chlorine room to avoid direct sunlight on the containers.

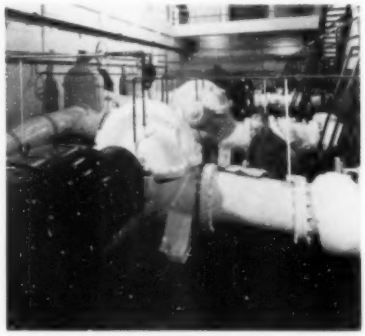
For stand-by service, storage space for dry chemicals is located on the upper floors of the plant. These chemicals are fed into hoppers at storage floor level and these in turn discharge into the dry feed machines located on the floor below.

A modern chemical laboratory, preparation room, and bacteriological laboratory are located within the plant to safeguard and provide for all of the facilities to maintain a rigid chemical control in the plant.

The plant operators make hourly tests of the water entering and leaving the plant. Chlorine and fluoride residuals and threshold odors are carefully checked for chemical feed control. Bacteriological tests are made daily on samples obtained from different sections of Hammond.

Plant Equipment

From the raw water flume, the water flows to twelve flocculating



● **Four low-lift pumps draw from a shore well, discharge to plant flume.**

chambers for a displacement period of 30 minutes. The chambers are arranged in three groups of four each and are controlled by sluice gates to permit operation either in parallel or series, or for double coagulation.

Each of the twelve compartments of the flocculating chambers is equipped with a vertical shaft and paddle having two speeds forward, and two speeds in reverse. These stirring mechanisms are driven by induction motors designed to operate at speeds of 1720 and 860 rpm by pole changing switch. The motors are mounted directly on speed reducing mechanisms proportioned to impart a peripheral speed to the paddles of 3.0 feet per second and 1.5 feet per second.

After the water is thoroughly mixed with the chemicals, it flows to the three sedimentation basins for a retention period of four hours. The basins are provided with a center baffle having an around-the-end flow. Stop plank grooves are provided at the inlet and outlet of the

basins permitting adjustment of the inflow and outflow of the water in order to secure the best sedimentation results. The basins are drained by means of a connection to the wash water sewer and are each equipped with fire hose connections so they may be periodically cleaned by manually hosing them out. The basins have flood lights and walkways which enable the operators to observe and sample the water, day or night, on its course through the basins.

There are 12 sand filters, each with a capacity of 2.5 mg at a 2-gallon per square foot rate of infiltration. The filters are constructed with a side gutter and steel wash water troughs having adjustable weir plates. These troughs are spaced on six-foot centers. The filter media consists of 18 inches of gravel and 30 inches of sand.

The filters are equipped with influent, effluent, wash water, wash drain and rewash controls together with the necessary instruments for regulating the rate of filtration and measuring and recording the rate of flow, loss of head and rate of back wash. A gauge panel board located at one end of the filter house records the depths in the filtered water basin and the wash water tank as well as recording the wash water and indicating the rate of flow. A 100,000-gallon tank is located above the head house to provide wash water for the filters. This tank is filled by a 3,000-gpm pump.

From the filters the water enters two 5-mg filtered water reservoirs. The water passes through a conduit designed to direct the water in a circulating path, thus taking advantage of the entire displacement to provide contact for post chlorination and ammoniation.

Four large tightly screened ventilating openings are constructed on the top of each reservoir, and one large ventilator for each is provided in the pipe gallery in the event it should become necessary to seal the openings on the top of the basin to guard against the entrance of fine lake sand or other foreign matter. A glass enclosed lighted inspection opening into one reservoir is located in the headhouse.

A portion of the reservoir underlies and supports the filters by means of a beam and slab construction. The balance of the reservoir is of a flat slab construction weighted down by earth fill to resist flotation, because the floor slab of the reservoir is about six feet below the main lake level.

From the filtered water reservoirs the water is pumped by the high lift pumps into the distribution system which serves for both domestic and industrial uses.

At the time the filtration plant was constructed in 1936 it was contemplated that future additional high lift pumping capacity would be required. During the last few years this has proven to be the case and the plant has been forced to operate at overloads during the summer months.

New Pump Station

Several projects were considered for providing this added capacity before the decision was made to discontinue using the existing high lift station and steam plant and erect a new adjoining wing to the present plant structure to house the new pumping units and other equipment additions.

Worthington was again called on to supply the new pumping equipment. This consists of five volute centrifugal pumps having a total pumping capacity of 116 mgd operating between head ranges of 140 and 196 feet. Four of the pumps are synchronous motor driven and the fifth unit is powered by a Worthington 1,250 horsepower dual fuel, 8-cylinder, turbocharged engine. Motors were furnished by Electric Machinery Mfg. Company. Pump data is shown in Table I.

Table 1—Data on Equipment in New Station

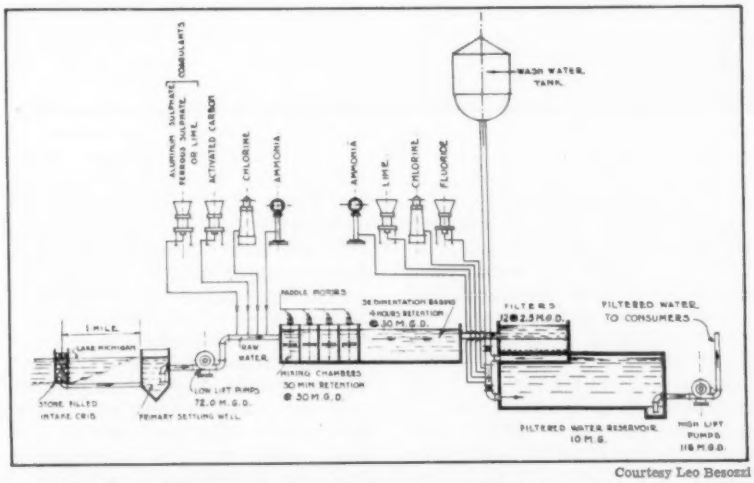
Unit	Capacity mgd	Capacity gpm	Head, ft.	Driver hp	Driver rpm	Pump Size
1	13.5	9,400	140	400	1,200	16LA-3
2	19.5	13,500	140	600	900	16LN28
3	23.0	16,000	153	700	900	16LN28
4	30.0	21,000	196	1,250	600	24LAS42
5	30.0	21,000	196	1,250	600	24LAS42

The engine, while primarily installed for stand-by service, is of the heavy duty type and as such can be used as the base pumping load for the plant on a 24-hour basis.

In mid-1956 work was begun on the new addition and service commenced early in 1957 at which time the old high lift pumps were retired from active operation. A special design feature of the new station is a 36-inch overflow conduit connecting the station's discharge pit to the raw water intake well. In the event of a break in the station, the flooding water would be carried away without disrupting service.

The interior of the new station is a galaxy of color. The pumps and cone valves are painted a bluish green and the motors are a bright yellow; the engine is light gray. Suction and discharge lines are painted a light gray. All piping and fittings are brass.

This fine addition to Hammond's water works will meet the present water needs of the city's people and industry and stands ready for the future today. Consulting Engineer for this project was Leo Besozzi.



Courtesy Leo Besozzi

● **DIAGRAM of treatment process. Water enters at left, is raised to intake raw water flume, passes through mixing and sedimentation units and through filters.**

SEALING BITUMINOUS CONCRETE PAVEMENTS

VAN R. SNYDER,
Bituminous Engineer,
Iowa State Highway Commission

THE IOWA State Highway Commission during 1957 contracted for 111.73 miles of single course bituminous seal coat to be applied to 1,657,382 sq. yds. of the primary road system in eighteen counties. The Willman Company of Hiawatha, Iowa, was awarded 78.67 miles (1,143,539 sq. yds.) of this seal coat work at a total cost of $133,279.66, or average cost of $0.117 psy. Jensen & Krage of Sioux City, Iowa, was awarded the remaining 33.06 miles (513,843 sq. yds.) at a total cost of $97,766.00 or average cost of $0.190 psy.

The road surfaces to be sealed were showing considerable alligatored type crack patterns with cracks generally of ⅛-in. or less in width and some of the bituminous surfaces were showing wear and ravelling due to oxidation of the asphalt. Asphalt cement seals were placed on flexible pavements of eight inches or more in total thickness with either bituminous surface treatment or bituminous concrete mat as the existing surface. Liquid asphalt seals were placed on flexible pavements of less than eight inches total thickness with an existing bituminous surface treatment.

This work was covered by specification section No. 2305, "Bituminous Seal Coat and Bituminous Surface Treatment, Inverted Penetration Type—Class "A" dated May 14, 1957. The cover aggregate specified in the contract was ½-in. size complying to the gradation shown in Table No. 1. The producers experienced difficulties in making this cover aggregate to the close production limits specified; however, our desire was to obtain a high-quality single size aggregate type surface so it was deemed necessary to comply to these limits. This difficulty in aggregate production contributed to the cost differential in the contracts for this work. Part of the projects were set up specifying 200-300 penetration asphalt cement and part were set up specifying either MC-4 or emulsion binder material RS-2 or AE-900. Basic quantities were estimated for contract purposes using 0.30 gal. psy for binder and 25 lbs. psy cover aggregate.

Representative samples of each aggregate used were analyzed by our laboratory for determination of sieve analysis, unit weight, specific gravity and percent of voids. Actual quantities of cover aggregate used were determined by calculating the spread ratio[1] based on average particle size (effective mat thickness) from the sieve analysis and converting to pounds per square yard. The square yard test board method should be used on aggregate containing flat and elongated particles whereby sufficient aggregate is spread on the test board to completely cover the area one stone in depth. This amount of aggregate is weighed and by dividing into the unit weight of the aggregate expressed in pounds per cubic yard. The spread ratio is determined and the effective mat thickness computed by dividing 36 inches by the spread ratio.

The quantity of bitumen used per square yard is computed by multiplying the percent of voids by the product of the effective mat thickness and the percent embedment desired. For the ½-in. cover aggregate we used 35 percent embedment. However, adjustment is made for embedment that might occur into the existing surface due to softening of the surface resulting from use of liquid asphalts or on existing soft bases or surfaces that would tend to allow the aggregate to penetrate partially. The condition of the existing surface being sealed is very important to consider in making the final determination of bitumen application. As a point of interest, generally our most satisfactory results were obtained by use of 0.35 gal. bitumen and 30 lbs. of cover aggregate per square yard sealed.

Preparation of Pavement

Our maintenance crews repaired broken and ravelled areas prior to the surfacing operations and patched pot holes, poor joints and settled areas with cold mix patch material. Also tight surface blading was done on areas showing irregularities or corrugations in the surface. Immediately before bitumen was applied, the contractor cleaned the existing surface by use of power driven rotary brooms and hand methods when necessary. Joints and cracks were not cleaned and filled other than by the normal brooming operations.

Generally prime was not applied on these projects except where nec-

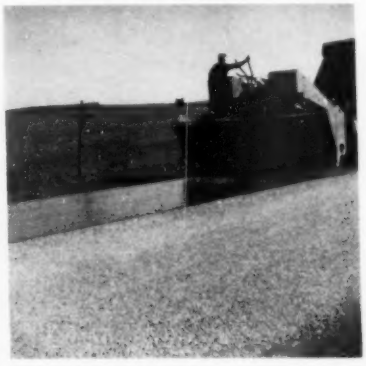
Table 1—Gradation of Cover Aggregate

Sieve Size	3/4-inch		1/2-inch		3/8-inch	
	Min.	Max.	Min.	Max.	Min.	Max.
1"	100	—	—	—	—	—
3/4"	95	100	100	—	—	—
1/2"	0	55	95	100	100	—
3/8"	0	15	0	15	95	100
No. 4	0	5	0	5	0	15
No. 8	—	—	—	—	0	5
No. 30	—	—	—	—	—	—
No. 200	0	1.5	0	1.5	0	1.5

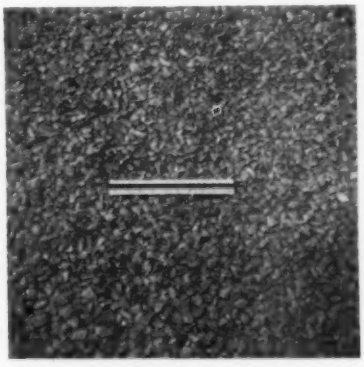
1 "Tests and Theories on Penetration Surfaces." J. P. Kearby.

essary in which case MC-1 prime was used. Specifications required the bituminous binder to be heated to temperatures at time of application to give a Saybolt Furol Viscosity of from 40 to 60 seconds. Generally for the 200-300 penetration asphalt cement this was 320-350°F. and for the RS-2 and AE-900 emulsion this was 125-170°F.

Binder bitumen was not to be applied until the surface was free from moisture and the atmospheric temperatures were not lower than 50°F. for liquid bitumens and 70°F. for asphalt cements. The length of spread of binder was limited to



● **DISTRIBUTOR operating adjacent to a completed lane is shown at the left. At the right a self-propelled aggregate spreader is making closing pass on the road.**



● **PNEUMATIC roller, self-propelled, was operated at up to 70 lbs. tire pressure, but 60 lbs. appeared better. Steel roller follows. At right is close-up of finished job.**

provide complete coverage with aggregate within 30 minutes after the binder was spread. Traffic was carried through the work so the binder was spread in two lanes with the first lane six inches greater than one-half the full width to be sealed. Transverse joints were made with use of 30-lb. roofing felt 36 inches wide. This type of joint was generally satisfactory when given close inspection.

Self-propelled pneumatic tired aggregate spreaders were required for spreading the cover aggregate to the freshly applied binder and very uniform spreading was accomplished by use of this type spreader. The aggregate was spread one-half the width to be sealed leaving six inches of bitumen uncovered until the second lane was covered with bitumen. We required follow-up on closing this lane as soon as the rolling was completed on the first lane and traffic could be turned over to the other lane. Particularly towards the cooler portion of our season, this longitudinal joint gave us difficulties in securing good aggregate retention within the six-inch lap area.

We required three complete roller coverages with the first two coverages using self-propelled pneumatic tired rollers weighing not less than 200 lbs. per inch of compaction width and operating at a tire inflation pressure of not less than 45 lbs. The third coverage was made with a self-propelled smooth steel roller with compression not less than 200 lbs. per inch width of compaction roll. Additional coverages requested by the engineer were paid for as extra work. No follow-up brooming or rolling the next day was required.

Our contractors furnished 8 to 10-ton self-propelled pneumatic tired rollers and 8-10 ton self-propelled smooth steel rollers for this work. On several projects the sequence of rolling was varied and the number of coverages varied up to double that required by specifications. Also the tire pressure of the pneumatic was increased from 45 lbs. up to 70 lbs. to observe embedment and retention characteristics under various tire pressures and coverages. From observations to date it appears better embedment was accomplished by using four coverages of the pneumatic rollers operating at the tire pressure of 60 lbs. followed by two complete coverages of the steel roller. The sections under observation and comparison are on the same road surfaces and constructed under similar weather conditions.

Weather Conditions

Weather conditions in Iowa during 1957 were poor for good seal coating work with considerable rain and cool damp weather limiting our operation materially and consequently some of the results were not very good. This was Iowa's first year in the use of the uniform-size aggregate type seal coat. While our experience is definitely limited to one year we feel the quality of our seal coats will be greatly improved with more experience by both our engineering force and the contractors.

The success of bituminous seals is largely dependent upon climatic conditions and its influence on the condition of the road surface at the time of application. The road surface must be dry and it is felt the surface should have a minimum temperature of 60°F. when liquid bitumens are used and 70°F. when asphalt cements are used. Our time limit of 30 minutes between application of bitumen and spreading cover aggregate is too high and should be reduced to give prompt coverage. This is most important for securing good embedment and retention of the aggregate along with immediate rolling. At this time it is felt six roller coverages are necessary; however, as time goes on and more attention is directed towards surface, bitumen and aggregate temperatures and prompt aggregate coverage and rolling, adequate embedment may be secured with less coverages. It is recognized that over-rolling can be harmful and defeat the purpose, especially under the steel roller where excess particle crushing can occur.

SEWAGE TREATMENT
for a 14 SQUARE MILE AREA

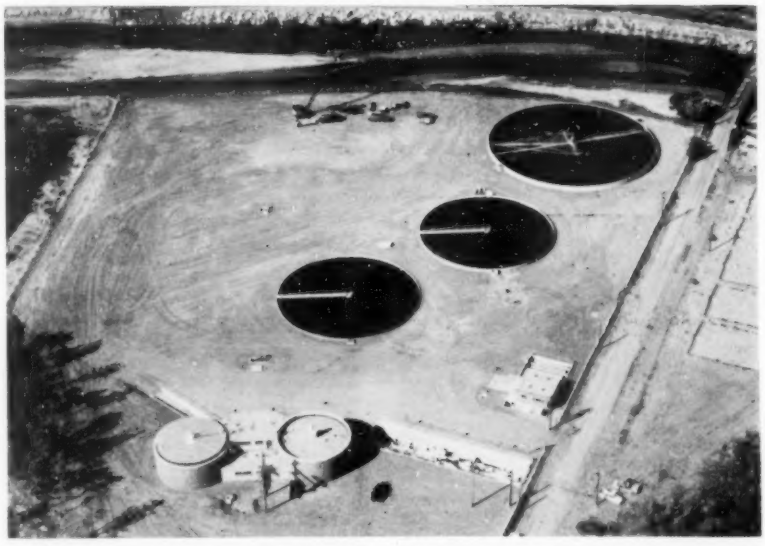
V. A. VASEEN,
President,
Ripple and Howe, Inc.,
Denver, Colorado

THE SOUTH ADAMS County Water and Sanitation District is a quasi-municipality organized under the Colorado Statutes. There is a Board of Directors which acts in regard to water and sanitation over an area of approximately 14 square miles north of Denver. Considerable expansion potential exists to the north but not to the east, south or west.

Following the installation of a water system, the area grew almost fantastically in assessed value, from $4,000,000 to $17,363,000 over a period of six years. This increase of growth in the area severely aggravated the problem of sewage disposal which was mainly by septic tanks and cesspools, to a point where not only State and local health departments were disturbed, but the people within the area itself became concerned. Consequently, at an election held in March, 1956, a bond issue authorizing $1,800,000 for the construction of sanitary sewers and sewage treatment plant was successfully passed.

The original installation of the sanitary sewer system had been planned as a complete gravity system throughout. However, since the original planning, a water system, a gas system and considerable paving had been installed. Since the ground is sandy, the deep cuts originally planned would have been excessive in cost, and it was consequently decided that sewage lift pumping stations were more economical than the deep cuts. Three Smith & Loveless expandible capacity package sewage pumping stations were installed by Westwood Construction Co. of Denver, at a total cost, including equipment, of $43,356.40. These were selected after considerable investigation throughout the United States indicating the extreme satisfaction of the users of this type of pumping station.

The large main outfall consisting of basically 30-inch, 24-inch and 21-inch concrete pipe was awarded to the Campsey Construction Company for $228,692; the second phase, the north one-third of the project, was let to the Wade Lahar Construction Co. of Arvada, Colorado, for $442,547.99. The total sewers installed consisted of 13,335 ft. of 30-in.; 7,366 ft. of 24-in.; 1,400 ft. of 21-in.; 5,403 ft. of 18-in.; 10,258 ft. of 15-in.; 12,807 ft. of 12-in.; 36,923 ft. of 10-in.; and 184,101 ft. of 8-in., with 772 manholes and 93 cleanouts.



● **PLANT layout for South Adams County Water and Sanitation District. The 144-ft. high rate filter is in background. Control building is between digesters.**

The sewage treatment plant contract was let to the Nielsen-Dougan Construction Company in October, 1956, for construction but not equipment, for $533,450. The total cost of the sewage treatment plant, including equipment was $633,303.11. The sewage treatment plant as designed by the engineers in 1956 anticipated an increase in effluent quality requirement as determined by the

EQUIPMENT FOR THE SEWAGE TREATMENT PLANT

Bar screen and grinder: Type VN, approximately 3' wide by 4' deep, suitable for handling an average daily flow of 2.5 mgd—Dorr-Oliver Inc.

Grit collector and mechanism: Approx. 2' wide by 35' long, suitable for handling an average daily flow of 2.5 mgd—Dorr-Oliver Inc.

Primary and secondary clarifier tank and mechanism: 100' diameter by 7' swd—Dorr-Oliver Inc.

Trickling filter distributor: 144' diameter, 500 gpm minimum rate and 1250 gpm maximum rate—Dorr-Oliver Inc.

Floating roof for primary digester: 45' diameter—Ralph B. Carter Co.

Floating roof gas holder for secondary digester: 45' diameter—Ralph B. Carter Co.

Chlorinator: Vacuum type solution feed, capacity 1,000 to 50 lbs. per day —Fischer and Porter Co.

Raw sludge pumps: 600 gpm capacity at tdh of 30 ft.—Dorr-Oliver Inc.

Heat exchanger and controls: 300,000 Btu per hour capacity—Pacific Flush Tank Co.

Colorado State Board of Health to be met by January 1, 1958. Therefore, the plant required very little alteration during final construction so that these new effluent standards could be complied with.

The sewage treatment plant was so designed and oriented on the property that the present construction consists of the first one-quarter of a "pie" arrangement, with various parts of the plant being so designed at this time that they will act in permanent capacity for all future anticipated flows from the drainage area above the plant. The automatic screening and grinding equipment has been set in a channel of reinforced concrete having two compartments, each compartment designed for twice the design capacity of the present plant. It will therefore be necessary that the Board add only the parallel equipment on the vacant side of the present channels in order to quadruple the ultimate capacity of the plant for screenings, grinding and grit removal. The screening and grinding equipment consists of Dorr-Oliver self cleaning rotary screens and a Sulzer Disintegrator with raking type grit washing equipment. The screening channel was also so constructed that, if found convenient at some future time, it will be possible for the unit to be housed.

It is anticipated that all future flows of the drainage area will pass to one wet pit underneath the control house. The design provided, as increased flows indicate a need, for the installation of two additional pumps having the same capacity as the three current 1750 gpm pumps. The electrical system has been predetermined to accommodate larger capacities.

All recirculation piping and other piping throughout the plant area has been sized in anticipation of the ultimate design of the plant. Consequently, it will be necessary only to make tie-in connections to the existing piping at the time future plant additions are made in order to expand facilities of the plant.

The most unusual feature of this plant is its completely automatic operation. A console type control system made by Fischer & Porter Company on special design is used as a control for the plant. It is mounted on the second floor of the control building between the two digesters, thus giving the operator complete visual control of his entire plant. Also to facilitate his operation, the console panel is of the graphic type with control lights indicating the various units of the plant so that the operator in glancing at the panel knows that all equipment is operating properly and that any lit signal indicates a need for attendance.

The plant is an accepted high rate design, including screening; grinding and grit removal; primary and secondary clarification; high rate filtration (1500 pounds of BOD per acre-foot per day); and chlorination.

A large part of the South Adams County Water and Sanitation District is industrial; actually one whole community called "Commerce Town" exists within the confines of the District. In view of the possibilities of the misuse of the sewers, strict rules and regulations have been adopted governing this, and an automatic pH meter, using a Beckman steel immersion assembly and Model W amplifier, has been installed in the influent to the plant so that should high or low pH be detected, the operator can time the cyclic appearance and initiate an investigation to determine the violator of the rules and regulations.

The control system involves step-programming of pumps in the main wet well in coordination with a butterfly valve automatically positioned to permit returned flow from the filter recirculation box to maintain a constant level in the wet well. The primary clarifier discharges to wet wells from which pumping to the trickling filter is also step-controlled. A high-level alarm is provided at this point.

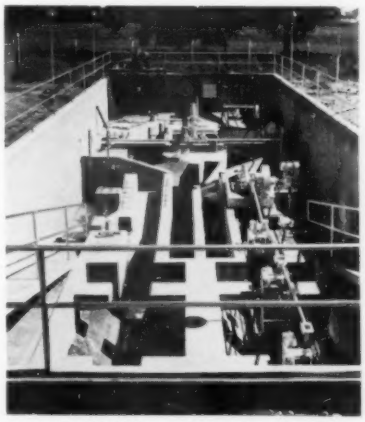
The control panel instrumentation includes an indicating, integrating recorder for plant influent flow; an influent pH recorder; a manual control for the recirculation valve; main wet well level indicator; temperature recorders for the digester heat exchanger; level indicators for both digesters; and an effluent flow recorder. Except in the case of the pH recorder, signal transmission is pneumatic. A self-purging bubbler system, using air from the plant's air supply, is used for level and pump control in the wet wells.

The sewage treatment plant was constructed partially from the Federal funds through Public Law 660. Although these funds were of considerable advantage to the District in the construction of this sewage treatment plant, they did require that certain features of the plant be constructed at this time which might have been postponed until needed at a future date. One of these items was the installation of larger pumps as well as the complete design and construction of the sludge drying beds.

It was the advice of the engineers that the sludge drying beds be constructed only to meet the immediate needs of the district. Several reasons existed for this recommendation; land area in the metropolitan Denver area is becoming increasingly more valuable, and consequently it was felt at the time major areas of sludge beds are needed. Land values would be inconsistent with the area being used and it would prove more economical to investigate sludge drying and possibly incineration or even the possibility of tank trucking the wet sludge from the digesters to grass or alfalfa lands not too distant from the District. The final analysis as to the disposal of the sludge will depend upon future reports of the engineers to the District at the time the problem must be met.

The sewage treatment plant has been constructed for a present capacity of of 2.5 mgd. It is anticipated that this will be sufficient for 10,000 equivalent domestic taps, an equivalent domestic tap being the flow of sewage from a single family residence estimated to be 250 gallons per day at average flow, with a BOD of between 250 and 300.

The Board of Directors of the District consist of P. G. Merilatt, Chairman; Julius R. Pershing, Secretary; Carlyle M. Edwards, Treasurer; and Ernest Martin and Russell Harner, members. Jack H. Maguire is Superintendent; Charles Byrne is attorney; and Charles A. Taylor, auditor. These men are to be congratulated for their foresight and ingenuity not only in solving a problem of water and sanitation but for administering the solution of this problem so that the utility thus created has been able to meet its increasing demands from operating revenues, while providing an untold value to its own area as well as to the metropolitan Denver area.



● **SCREENING and grinding chamber, like the remainder of the plant, is designed for future expansion if needed.**

CONTROL OF RODENTS and INSECTS ON DUMPS

RODENT CONTROL

WILLIAM D. FITZWATER,
Branch of Predator and Rodent Control,
U. S. Fish & Wildlife Service

SOME PEOPLE have expressed the opinion that rats on a public dump are useful as unpaid garbage grinders, but, fortunately, this idea has never swept the country. Actually rats are of no value whatever and the large numbers spawned on insanitary dumps are a constant health hazard and a source of economic loss to the surrounding community. Besides the fifteen diseases that rats are able to pass on to humans, the danger to domestic animals and pets should not be overlooked. For example, within the last few years, a small midwestern city had a serious outbreak of leptospirosis in dogs that was directly traced to the rats on a local dump. Rats should not be permitted to exist unchecked on any public or private dumping grounds as they constantly move out from there to infest the surrounding country, particularly after the arrival of cold weather.

The best control for this pest on dumping grounds is to remove or prevent access to the food and shelter that attracts them. Proper disposal of wastes is desirable by effective sanitary techniques, such as a sanitary fill or incineration. This article concerns closing a dump, combatting rat populations that have gotten out of hand and procedures for small communities where the cost of earth-moving equipment essential to proper maintenance of a sanitary land-fill may be mistakenly considered expensive.

Poisons in Control

A number of chemicals are available as rodenticides. Some of these are decidedly superior, under certain situations, to others. However, the effectiveness of all poisons is directly proportional to the bait components; the thoroughness with which they are mixed; and the placement of the finished bait.

Table I lists briefly the main considerations in choosing the proper rodenticide. Those poisons best fulfilling a particular category are listed as "1", the poorest as "4". A more comprehensive comparison of these various poisons will be found in a U. S. Fish and Wildlife Service Publication.[2]

Other poisons, such as arsenic, barium carbonate, phosphorus and strychnine are no longer recommended for the control of rats on dumps, though some of these have utility as rodenticides under other circumstances.

Anticoagulants (Diphacin, Fumarin, Pival, and Warfarin), are rodenticides that cause hemorrhaging and subsequent death by shock due to loss of blood. To be killed, however, rats must eat the bait for three or more days. Their chief advantage lies in the inability of rats to associate their declining health with the bait they are eating. As rats must take considerable amounts of this poisoned bait in order to get a lethal dose, it is not usually practical to use anticoagulants where large numbers of rats are present on a public dump. Their best use lies as a follow-up poison to keep rats at a low level. Anticoagulants are reasonably safe when placed in permanent-type stations over the dumping area.

Antu (alphanapthythiourea), is a cheap, effective killer, but has the disadvantage of being readily detected by rats. Therefore, it should not be repeated for at least a six-month period after first use. While it is not dangerous to humans, many

Table 1—Characteristics of Rodenticides

Rodenticide	*Percentage in Bait*	*Degree of Effectiveness*	*Degree of Acceptance*	*Degree of Reacceptance*	*Tolerance Developed*	*Odor*	*Taste*	*Chemical Deterioration in Baits*	*Secondary Hazards to Other Animals*	*Degree of Hazard in Human Use*
Anticoagulants	0.025*	1	1	1	1	1	2	1	2	1
Antu	1.5	1	1	4	4	2	3	2	4	1
Compound 1080	0.002	1	1	1	1	1	2	2	4	4
Red Squill	10.0	2	2	4	1	3	4	3	1	1
Thallium Sulfate	1.5	1	1	1	1	1	2	1	4	4
Zinc Phosphide	1.0	1	1	1	1	4	4	4	2	3

*Diphacin is used at 0.005 percent.

animals, particularly dogs and pigs, are very susceptible. Antu is not readily available in stores but can be obtained from manufacturers by qualified users.

Compound 1080 (Sodium fluoroacetate), while a very effective rodenticide, is also the most toxic of all compounds to both man and other animals. It should be applied only under the supervision of pest control operators or other qualified personnel and only on dumps that can be adequately protected from trespassing by humans and domestic animals. The secondary poisoning hazard is so extreme it is likely that cats or dogs visiting a dump area will be killed.

Red Squill contains an emetic that causes most animals, other than rats, to vomit the bait. Therefore, it can be used safely on most dump locations. As it is not particularly acceptable to rats, it must be carefully prepared in an attractive bait base, such as horsemeat or fish. Care should also be exercised in using only a "fortified" red squill testing 500 mg/kg or lower to assure adequate kills.

Thallium Sulfate is a very toxic poison that, like Compound 1080, should be handled only by qualified personnel well-acquainted with its characteristics.

Zinc Phosphide is a strong-smelling rodenticide but the odor is actually attractive to rodents. Danger to man and other animals is somewhat less than thallium sulfate due to its warning odor. It is one of the least costly rodenticides.

Poison Baits

After selecting a rodenticide for a particular set of conditions, the next consideration is the bait components. While there is no "best" bait, ground horsemeat or fish are the two most acceptable bases. Ground or rolled oats are sometimes added to the mixture as extenders to lower costs without decreasing acceptance. When available in quantity at low cost, various fruits and vegetables are sometimes used, particularly with zinc phosphide or antu. Compound 1080 can be used as a water bait in small receptacles over the dump. We have also used it very effectively in a dry cornmeal bait.[3] Due to the length of time anticoagulant baits must remain in the field, these baits are commonly prepared in a cereal base. The effectiveness of the poison is directly proportional to the care taken in using the right proportion of the rodenticide to the bait material and the thoroughness with which the components are mixed. Suggested bait formulas include the following:

Squill—Lean, ground horsemeat or fish, 70 lbs.; rolled oats, 20 lbs.; red squill 10 lbs.; and water enough to make the bait moist but not sloppy. If desired, 1.5 lbs. of thallium sulfate or antu or 1.0 lb. of zinc phosphide can be substituted for the red squill, with proportionate increases in food to make up 100 lbs.

Zinc Phosphide—Rolled oats, 94 lbs.; corn, peanut or other vegetable oil, 5 lbs.; and zinc phosphide, 1.0 lb.

Antu—Diced melon, apple or other fruit, 98.5 lbs.; and antu, 1.5 lbs. If desired, 1.0 lb. of zinc phosphide can be used in place of antu.

Anticoagulant — Whole ground yellow corn, 60 lbs.; ground oat groats or rolled oats, 25 lbs.; sugar, 5 lbs.; corn, peanut or other vegetable oil, 5 lbs.; and anticoagulant poison concentrate, (0.5%) 5 lbs.

It is sometimes cheaper and usually much better to obtain ready-mixed bait from local pest control operators who are equipped to supply the chemical and mix it satisfactorily. Larger corporate units with a continuing problem may find it preferable to purchase special machinery. Suggestions on satisfactory equipment of this nature as well as bait formulas can be obtained from state (USFWS) branch predator and rodent control representatives.

The last consideration is proper placement. If practical, this operation should be scheduled during afternoon hours on week-ends or holidays, when the dump is closed to the public. Bait in tablespoonful quantities should be widely placed over the active dump face rather than exposed in large amounts in only a few places. Care should be taken to place bait under cover used by rats rather than to throw it carelessly out in the open where it may at times be hazardous to birdlife, particularly sea gulls. Bait placed in this fashion is more readily encountered by the rats. The method also minimizes the hazards to humans and domestic animals. Some workers wrap baits in lightweight paper squares to minimize further the danger to other animals. This technique has questionable value, except possibly at dumps where bait must be thrown onto very steep, loose faces that cannot be safely climbed. While it normally takes from 50 to 100 pounds of bait to treat a one-acre dump, this figure will vary considerably with the rat population present and the extent of the dumping face. A close estimation of needs can be obtained by using one pound of bait per linear yard of dump face.[4]

Dumps can be baited at any season, but when rat numbers make it necessary to repeat this practice more than three or four times a year, serious consideration should be given to improvement of the dump's sanitary operation. When-

Photos Courtesy Fish & Wildlife Service

● "UNWANTED" dump attendant. Rats cannot be controlled under conditions illustrated here. Poisons can help only temporarily; better disposal methods are needed.

ever dumps are to be closed or their physical operation changed, it is advisable to start poisoning a week or more before any changes take place and repeat the poisoning operation a week afterwards. This may prevent wholesale migration of rats to nearby homes. A dump that has been closed should be bulldozed and covered with two or more feet of compacted clean fill.

When a dump is to be poisoned, all possible precautions should be taken to prevent accidental poisonings. Warning signs should be posted at frequent intervals around the dumping ground borders. Local newspapers should be given public-

● **BAITS using anti-coagulant poisons should be placed in protected stations.**

ity notices of the operation, warning citizens not to let their animals roam unchecked and not to pick up any of the poisoned bait.

Bait Stations

As stated above, it is usually more economical to treat the dump first with a fast-acting poison and then follow it with an anticoagulant. These latter baits, due to their long exposure, should be placed under protective cover. Wooden bait boxes especially designed for this purpose can be built.[5] However, equally effective stations can be fabricated from various materials found on the dump — discarded foot lockers, wooden boxes, five-pound lard cans, old tires, etc. These should have openings no larger than three inches and be strong enough to resist the attempts of larger animals to get into them. Warnings should be painted on the stations and they should be placed where they will be least likely to be moved or disturbed. Good locations are those that lie between the main nesting areas (usually on undisturbed slopes adjacent to the active face) and the fresh dumping area. The bait should be replenished at intervals of not more than a month. Uneaten bait should be discarded at this time and replaced with fresh material.

Using Gas in Rat Control

Where rats have established themselves in undisturbed ground adjacent to the dumping areas, it is also practical to supplement the poisoning operation with gas. One gas for this purpose is calcium cyanide (Cyanogas A Dust) applied with an especially designed foot-pump duster. The best results are obtained when the gas is used at temperatures of 60°F. or higher. All burrow openings that can be seen should be treated at the same time. As each burrow is treated, cover and pack the hole with loose dirt before moving on to the next one. If the gas is detected coming from an adjacent hole it can be plugged without further treatment. While

● **GASSING can supplement poisoning.**

reasonably safe to use out-of-doors, and possessing no residual hazard, this gas will kill all forms of life including humans and should be handled only by responsible persons.

References

1. Vandewerker, Ralph J., and Leo Weaver, "Refuse Collection and Disposal," *Public Health Bibliography Series No. 4*, U. S. Federal Security Agency, Public Health Service, (1950).
2. U. S. Fish and Wildlife Service, "Characteristics of Common Rodenticides," *Leaflet WL — 337*, (1952).
3. Osmun, John V., "Compound 1080 for Initial Rat Control in Dumps," *Pest Control Magazine*, 19:11 pp. 9-10, (1951).
4. Oderkirk, Galen C., Ernest M. Mills, and Milton Caroline, "Rat Control on Public Dumps," *Pest Control Magazine*, 23:8, pp. 24-28, (1955).
5. Oderkirk, Galen C., "Bait Stations," processed leaflet, U. S. Fish and Wildlife Service, Lafayette, Indiana, (1957).

APPLICATION OF INSECTICIDES AT DUMPS

G. C. LA BRECQUE,

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Agricultural Research Service,
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IN MANY communities troublesome insect infestations may be directly attributed to local dumps, which often provide ideal environments for the propagation and dispersal of many species. Because of the normal isolation of dump areas, these conditions are often overlooked until they become critical, and unless a definite insect-control program is carried out, serious outbreaks may result. Although many of the insects breeding in dump areas are of little medical importance, a few species, particularly flies and mosquitoes, constitute hazards to man by acting as disease carriers. Sanitary fills provide the most satisfactory method of controlling such insects. If fills are not used, a well-planned program of insecticide applications should be employed.

House flies and blow flies breed prolifically in decaying organic matter of vegetable and animal origin. In many areas house flies have become resistant to chlorinated hydrocarbon insecticides such as DDT and BHC, but they may be easily controlled with dry or liquid baits or sprays containing an organophosphorus insecticide, such as malathion, Dipterex, or Diazinon. For dry baits, they are used at a concentration of 1 or 2 percent in sugar, sand, or cornmeal. If sand or cornmeal is used, 10 to 20 percent of sugar should be added as an attractant. These baits are easily distributed from a shaker-top can or a

● DRY baits, easily distributed from shaker-top jar, are effective if sprinkled lightly over the surface of the dump area.

● LIQUID baits are applied with sprayer. A coarse or cyclone nozzle without whirl-plate must be used with the thicker baits.

pint jar with holes punched in the lid. For best results they should be sprinkled thinly over the refuse, particularly at places where flies congregate, at the rate of 2 to 4 ounces per 1,000 square feet. Dry baits are most effective on dry, flat, and nonporous surfaces; on loose materials the bait will sift through and become unavailable to the flies.

Liquid baits are particularly useful when large populations of blow flies are present. Blow flies do not readily consume dry baits, but both blow flies and house flies will feed on baits containing 2 percent of malathion, Dipterex, Dow ET-57 (commercially available as Korlan), or Diazinon in a 50 to 75 percent solution of malt or molasses in water. Molasses is more economical than malt and almost as attractive. The bait is easily applied with a sprinkling can or a 3-gallon compressed-air sprayer from which the whirl-plate of the nozzle has been removed. At the rate of 1 gallon of bait per 1,000 square feet, it will satisfactorily reduce fly populations.

Dry or liquid baits provide spectacular immediate control but little residual control. They should therefore be applied daily until the breeding of the insects has been greatly reduced, usually requiring 2 to 3 weeks. Thereafter, the baits may be applied every 2 to 3 days, or as necessary.

Contact sprays consist of insecticides in solution in kerosene or fuel oil, dispersed in finely distributed particles in such great numbers into the air mass over the dump that neither flying nor resting flies can avoid contact with lethal amounts. A spray containing 0.1 percent of synergized pyrethrins, 1.25 to 2 percent of malathion or Dow ET-57, or 0.5 to 1 percent of Diazinon will rapidly control adult flies if the area is well covered. Like baits, contact sprays must be applied frequently to maintain a high level of control.

Residual sprays are usually more satisfactory than contact sprays for the treatment of dumps. Although the reduction in number of flies is not so rapid, the insecticide is effective over a longer period of time, as it is sprayed directly on the surfaces upon which flies rest, and little is lost due to evaporation or drifting, a common occurrence with contact sprays. These sprays can be prepared from wettable powders or emulsifiable concentrates of malathion, Dow ET-57, or Diazinon to form a 2-percent suspension, which is dispersed at the rate of 2 gallons per 1,000 square feet. The spray should be applied not only to breeding areas in the dump proper, but also on shrubs and other resting sites about the perimeter of the dump.

Burning refuse in dumps will seldom give good fly control, as most of the materials that favor fly breeding are moist and do not burn readily or completely. Half-burned garbage can be a source of prolific breeding.

Several species of pest mosquitoes may also be found in dumps, where they breed abundantly in tubs, tin cans, barrels, or other containers holding stagnant water. Mosquitoes are seldom the pests that house flies or blow flies are, but may at times cause serious infestations.

The most economical time to control mosquitoes is when they are in the larval stage. Elimination of the containers in which they are breeding is the most satisfactory method. When this is not feasible, the dump should be sprayed or dusted with a larvicide. Petroleum oil, DDT, BHC, or any of the residual sprays previously mentioned are suitable. Care must be taken to assure that the water in all the breeding sites is treated.

The contact and residual sprays recommended for the control of adult flies will also reduce adult mosquito populations. When sprays are used for adult mosquito control, the environs of the dump are again of great importance, as adult mosquitoes normally seek cool, dark, and humid places, such as shrubs or hollow logs, for resting in daytime. Unless such places are also treated with insecticides, mosquitoes will quickly reinfest the dump area.

Hand-operated compressed-air sprayers are suitable for applying residual insecticides to small dumps. Hydraulic or pneumatic power sprayers or thermal fog generators, many types of which are available, are preferable for use in larger dumping areas. On most of these machines droplet size can be regulated for application of either contact or residual sprays.

It should be remembered at all times that insecticides, though safe for the purpose recommended, are poisons. These materials kill insects by affecting some life process, and to a certain degree many of them affect the human body likewise. The precautions given on the container should be followed carefully.

By the judicious use of insecticides, insect population can be suppressed to a degree that a dump will no longer be a source of insect infestation.

LEASING OF MOTOR EQUIPMENT

J. J. CARRELL,

Director of Training,

International City Managers' Assn.

THERE is a good deal of fuzzy thinking on the subject of leasing of motor equipment. Probably all of us who have been engaged in the operation of a motor fleet have been guilty of accepting some of the claims and counter-claims at face value. Is leasing better than public ownership? Is leasing better than reimbursement of employees for the use of their private cars on public business? How does the public works administrator begin to approach the question of the advisability of leasing equipment?

The first step for achievement of sound fleet and equipment operations might be to establish a system of simple but accurate and up-to-date cost records. The advocates of leasing lean heavily on the argument that it will result in lower cost to the lessee. There are other persuasive arguments, but this is the chief selling point for leasing. Simple cost records on equipment will usually make it possible with systematic analysis to evaluate the "cheaper cost" claims easily.

The contention that leasing results in lower cost to the lessee is based on several other claims: (1) Through careful and experienced maintenance of vehicles, the cost of operation is reduced from what it would be if unsatisfactory maintenance were done by the public agency; (2) the city is free of the cost attendant in purchasing the equipment (the administrative costs); (3) the public agency is saved the cost of maintaining property records for city owned equipment; (4) because of volume purchasing the leasing company can secure the equipment at lower prices; (5) leasing provides a "hedge" against inflation—that is, if the price of used cars goes down rapidly while new car prices remain high or increase the public is protected against the spread in replacement cost; (6) the leasing company can, through volume purchasing of insurance, provide a further reduction in cost; and (7) the public is protected from loss resulting from obsolescence of equipment.

If city maintenance is inadequate leasing may well produce substantial savings and this is not a rare condition, even among cities otherwise efficiently run. Although times have changed, Alexandria, Va., in 1951, is a case in point. A lease contract was signed by the city in July of that year for the rental of passenger automobiles. The city recognized that its repair shop was less efficient than the private garage. The differential in wage scale made it impossible to attract the highly trained maintenance specialists needed to keep the city fleet at a high level of efficiency. Further the city garage was poorly equipped because of reluctance to request the city fathers to appropriate money for the purchase of special machines and "diagnostic" equipment which would be found in better private garages.

The smaller cities are generally more subject to this failing than are the larger communities. Many do not understand the uses of simple cost records, and are unfamiliar with the system of cost record installation.

While it is true that a city will be free of administrative costs connected with purchasing equipment, and from the cost of maintaining property records on the equipment, there are new administrative costs peculiar to lease agreements. The city must expend the time and effort (which are expensive) in the preparation of a contract and in the necessary checks on the operation of the contract. Even in leasing contracts which cover full maintenance the city is normally responsible for the administrative costs attendant upon purchasing of gasoline, washing, and sometimes of insurance.

A leasing company located in another city will incur administrative costs and bookkeeping costs resulting from the necessity for agreements with a local garage, and these costs will surely be passed on to the city. The leasing agency, in addition, will necessarily have purchasing costs, and these will be passed on to the city in the leasing charges. Nor can the city escape some costs which will duplicate the investment of the leasing company: such things as spot checking garages doing the maintenance, and reviewing the many details of the operations of the contract. There will be no savings on gas and oil records since these will normally have to be maintained by the city.

In the case of a city with a small fleet there may be some difference in the purchase price of vehicles as compared with a large volume leasing company. If the city fleet is of large size there should be relatively little difference between city purchase price and leasing company purchase price.

While it is true that leasing provides a hedge against inflation—that it provides protection against rising sale prices for new automobiles and lower sale prices of used cars—there is another side to this coin. In a period when the prices of used cars are rising or in a deflationary market for new cars the public would stand to lose through a leasing agreement. In either case the difference would probably not be significant since most equipment purchased new will be sold by the city at the end of two years.

There can be no doubt that the public is protected from loss due to obsolescence of equipment when equipment is leased. But is the price paid worth this protection? The argument for leasing is especially strong on this point in the case of heavy equipment which has a normal life several years longer than the life of passenger vehicles and trucks.

Other Advantages

Although the advocates of leasing put most of their eggs in the "cost" basket they do claim several other advantages for leasing.

It is said, for example, that under leasing agreements when the vehicle

is out of service it can be replaced more immediately and with less trouble. This is probably true in many situations and can be a very helpful feature of leasing. However it is a claim that is most valid in the case of smaller fleets. In large fleets the same service can probably be provided at less cost.

Those who advocate leasing say that it enables the city to rely on fixed transportation costs and in this way to budget such costs with accuracy. This is true, but simple cost records which can be maintained by any city, regardless of size, will accomplish the same results.

It is claimed that better vehicles are provided through leasing. If this is true, then the city taking advantage of leasing is operating on a double standard. There is no magic connected with leasing: if better vehicles and more recent models are provided the public is paying for it. Some cities, however, will enter a leasing agreement which provides a new vehicle every one or two years but would not consider a schedule of this sort if the cars were city owned.

Leasing companies will provide periodic reports on the condition of each vehicle and this type of information is helpful in training drivers to reduce mileage costs for gasoline and oil. Any well run city fleet, however, will have this information constantly available and up-to-date on each vehicle.

Some say that leasing saves executive time and worry, but any such savings are debatable. The leasing contract must be carefully drawn and put out for bids; periodic checks must be made on the operation of the contract; and many city records which would be maintained on a city-owned fleet must be maintained for a leased fleet. There is, in addition, the political problem of persuading the average citizen that there is some merit in saving the executive time but spending more public money.

Leasing contracts can be drawn in such a way as to provide for full maintenance. This can eliminate effectively maintenance problems and worries for the officials. To do this however, the leasing company must be paid a relatively high price. Normally the city will attend to simple maintenance in order to avoid the extra cost.

Does leasing provide peak-load facilities more economically than public ownership? This can be answered only in the affirmative. It is a strong argument for a particular type of leasing agreement.

Counterclaims

A leasing company is a private company and a profit making or-

COST AND EARNINGS DATA

Month (1)	Gasoline (2) Gals (A)	Gasoline (2) Amount (B)	Oil (3) Qts. (A)	Oil (3) Amount (B)	Tires And Other Supplies (4)	Washing And Greasing (5)	Repair Labor (6) Hrs. (A)	Repair Labor (6) Amount (B)	Repair Parts (7)	Outside Repairs (8)	Insurance (9)	Depreciation (10)	(11)	Overhead (12)	Total Cost This Month (13)	Total Cost Year to Date (14)	Rentals Earned (Credit) This Month (15)	Rentals Earned (Credit) Year to Date (16)
Totals 1st Quarter																		
Totals 2nd Quarter																		
Totals 3rd Quarter																		
Totals 4th Quarter																		
Totals For Year																		

Make _____

Model _____

Type _____

Capacity _____

Date Purchased _____

Book Value Start of Year $ _____ Insured Value $ _____

Insurance Premiums

Liability	$	
Property Damage	$	
Fire and Theft — Car	$	
Fire and Theft — Appliances	$	
Total For Year	$	
Insurance Per Month	$	
Depreciation Per ____	$	
Rental Per ____	$	

EFFICIENCY DATA

Month (17)	Mileage End of Month (18)	Miles Run (19)	Cost Per Mile 13 - 19 (20)	Mile Per Gal Gas 19 - 2A (21)	Miles Per Qt Oil 19 - 3A (22)	Hours Run (23)	Cost Per Hour 13 - 23 (24)	Potential Hours of Use (25)	Hours In Shop (26)	Hrs Avail For Use 25 - 26 (27)	On-Shift Hours Run (28)	% Of Avail 28 ÷ 27 (29)	Off-Shift Hrs Run (30)
Totals 1st Quarter													
Totals 2nd Quarter													
Totals 3rd Quarter													
Totals 4th Quarter													
Totals For Year													

Courtesy Public Administration Service

● **INDIVIDUAL equipment record. This form permits gathering the basic data on which costs of operation can be computed.**

ganization. The company is not in business to "break even". It is only reasonable to expect that the city must pay the cost of the profit margin. A minimum reasonable profit figure might be assumed to be four or five percent.

Leasing arrangements normally leave to the city the responsibility for paying the cost of licenses and taxes, since ownership is in the hands of the private company. Lease-purchase agreements which are becoming increasingly popular in private business fleet leasing, may eliminate this argument as an advantage of public ownership.

Most leasing companies find it necessary to borrow money in order to make their equipment purchases. The interest cost on this borrowed money would probably be not less than five percent. Few, if any cities will make such allowance on investments in automotive equipment, but in the case of leasing companies this cost is included in the general leasing charge. This is an "extra" as compared with city ownership.

For their own protection, leasing companies will normally depreciate their equipment more rapidly than will be found necessary by a city. The leasing companies for example will depreciate trucks completely in about five years. While depreciation rates do vary, the actual life of the vehicle will be perhaps two to three or four years longer than this depreciation term. For example, if a truck costs $4,500 when new and is depreciated a full 100 percent in a five-year period the depreciation cost per year would be $900. If a city were to purchase the vehicle and retain it in operation for six years the depreciation cost per year would be $750 per year. In other words, the city would make a saving of approximately $150 per year in depreciation costs—a total saving of about $900.

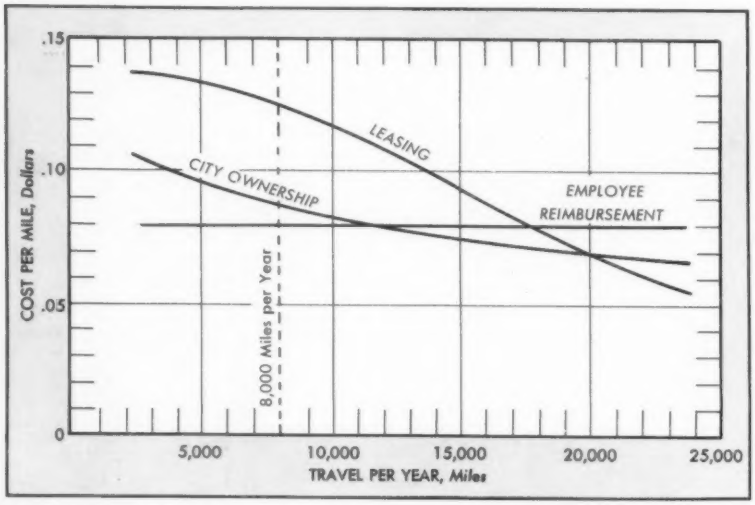
Trucks and Heavy Equipment

Except for the fact that expected life under given types of use is more important than total annual mileage, there are only slight differences in the rental of trucks and other equipment as compared with passenger automobiles rental. "Limited use" seems to be the key to the decision to lease or rent rather than own equipment and trucks.

Special equipment or unusual equipment used in "spot" situations for a short period of time will almost invariably be more economical to rent than to own. Similarly, a public organization with relatively few trucks, using them only for a limited period of the year will probably find it cheaper to rent than to own. In the case of small organizations any type of equipment calling for unusually high maintenance costs—for example, bulldozers working on sanitary fills,—may be cheaper if rented.

Just as in the case of automobile rentals however, in each instance cost records and other factual information must be collected before an intelligent decision can be made between public ownership and rental of trucks or other equipment.

Even the largest city—Chicago is one example—will find great advantage in leasing arrangements to cover emergencies. Probably the most common type of "emergencies" agreement is that covering the provision of snow removal equipment. Many such contracts call for a minimum prescribed number of days of service. This means that the city is required to pay for that minimum number of days, regardless of whether the equipment is placed in use. Some communities are fortunate enough to arrange contracts which call for payment only for the actual truck operating time on an hourly basis. The City of Chicago has what apparently is an unique type of emergency standby leasing arrangement covering snow removal equipment. The city makes no contract with the trucking firm, but simply advertises for bids and retains bids on file. When an emergency demands it, the company is notified by telephone and payment is made on the basis of the "price per day" package (including the cost of equipment, insurance, etc.) which was listed in the bid. In this manner, the city pays no additional charges.



● **GRAPHICAL comparison of passenger automobile operation costs. These figures do not represent the experience of any particular city but show how a graph, made up with a City's own cost figures, can determine the relative advantages of each system. For example, if a given assignment calls for travel of 8,000 miles per year, employee reimbursement would cost less than either municipal ownership or leasing.**

Terms For Equipment Rental

It may be helpful to quote the statement of general industry practice with regard to equipment rental which is found in a publication of the Associated Equipment Distributors with offices in Chicago. "It is the general practice in industry to base rates on one shift of eight hours per day, forty hours per week or 176 hours per month of a 30-consecutive-day period. If the equipment is rented by the day, the rate for overtime is one-eighth of the daily rate for each hour in excess of eight. If it is rented by the week the rate for overtime is one-fortieth of the rate for each hour in excess of forty, and so forth.

"The lessor bears the cost of repairs due to normal wear and tear on non-tractor equipment, and the lessee bears all other costs. As for tractor equipment and/or rubber tired hauling equipment, the lessee bears all costs for maintenance and repairs. The equipment rented is to be delivered to the lessee in good operating condition and is to be returned to the lessor in the same condition as delivered, less normal wear. Where excess cleaning or repairs are necessary, many lessors have made additional charges for this cleaning and repair.

(*Continued on page* 147)

SINGLE BEAM CONSTRUCTION

Carries Sewer Pipe Across Stream

RALPH CROSMAN

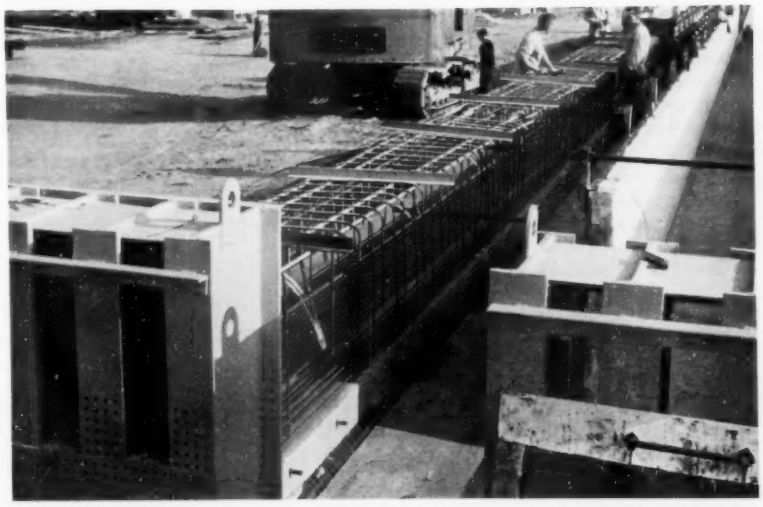
A NEW method of building a sewer-pipe across a stream has been used by the Metropolitan District, the agency which has charge of sewer and water systems in the city of Hartford and six surrounding towns in central Connecticut. This involved the use of a 65-ft. prestressed concrete beam, encasing a 24-in. sewer-pipe, to span Piper Brook, in the town of Newington, in order to connect two large trunk sewer lines.

One advantage of the single-beam construction, as compared with such usual methods as an inverted siphon under the stream bed, said Arthur W. Sweeton, 3rd, chief engineer of the Bureau of Public Works, of the Metropolitan District, is economy in both original construction and in upkeep. Building a long single-span sewer bridge, complete and in place, would generally cost less than a bridge with several spans on piers; it would also be less costly than an inverted siphon, with special end man holes, said Mr. Sweeton. In addition, the cost of cleaning the sewer-pipe in a straight grade bridge would probably be less than cleaning the inverted siphon type of construction. And a single span, without piers, offers less resistance to flooded streams than several piers, in a stream of the same width.

This single-span type of sewer-bridge construction was originated by Mr. Sweeton who conceived the idea of adapting the individual hollow prestressed concrete beam now used in some highway bridges, for use as a sewer-bridge.

As installed at Newington, Conn., the bridge-beam is 36 ins. wide and 36 ins. deep (outside dimensions), with a 24-in. Transite pipe cast in, as the sewer lining. End to end, the beam is 65 feet long, which gives a clear span of 62 feet, between abutments.

The ends of the several 13-ft. lengths of asbestos-cement sewer-pipe—supported in the beam form a little above the center of the beam—were butted together and lapped with tar paper, instead of being joined with the conventional external couplings, in order to avoid any possible weakening of the beam. Twenty-seven $^3/_8$-in. stress relieved



● **REINFORCING** cage for prestressed bridge beam ready to be placed in the form. Beam was 36 ins. by 36 ins. Span was 65 ft. For finished job, see following page.

● **POURING** the beam with the 24-inch asbestos-cement pipe in place in the form. A low-slump concrete was used, so that vibration was necessary. Weight was 31 tons.

● **PLACEMENT** of concrete mix was fillowed by vacuuming (note vacuum piping in the side forms). Temporary eye-bolts for lifting beam into place are shown.

strands, stressed to 14,000 lbs. each, or a total of 378,000 lbs., were placed in the sewer beam to prevent any cracking due to bending, even when the pipe line is empty, under a flood water moving at 10 ft. a second, 3 ft. over top of the beam.

The sub-structure of this sewer crossing was constructed in the usual manner, with concrete cast on the site, but an innovation was the use of graphite impregnated asbestos pads, for bearings at either end, underneath the beam, and expansion-joint material at the sides and top of the beam, to permit the 65-ft. beam to float with changes in temperature.

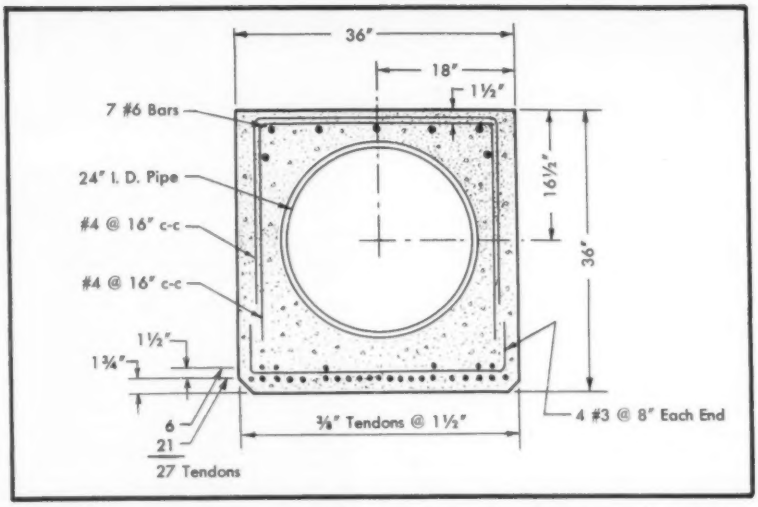
Great care had to be used in lifting and moving the beam from the casting bed to its final position on the abutments, in order to avoid any dangerous reversal of stresses within the beam. The 31-ton beam was lifted and set in its final resting place on the graphite asbestos pads on each abutment by using two cranes, one at each end of the beam. Four special anchorage assemblies had been cast into each end of the beam to hold temporary eye-bolts, for lifting.

In order to provide for some flexibility, and some expanding and contracting of the bridge beam, and in order to secure watertight jointing at each end between the bridge sockets and adjacent sewer spigots, a Lock Joint Company flexible rubber joint was used.

Shop drawing preparations and the actual casting of the beam were done by the Concrete Products of America, Division of the American-Marietta Company, at their plant in Kenville, New Jersey.

The concrete was cast around the Transite pipe in approximately three hours, and was followed by vacuuming to remove moisture in the concrete. Forms were stripped from the beam sides approximately one hour after pouring was completed.

The design basis for the prestressed beam was as follows: Dead load weight of beam and asbestos-cement pipe; vertical live load, pipe full of water plus 50 lbs. per sq. ft. additional live load; transverse live load, 133 lbs. per sq. ft. (stream flood flow); bouyancy (with no water in 24-in. pipe) shall be considered as it affects the design of the beam; vertical deflection shall not be more than 2 ins.; horizontal deflection shall not be more than 1 in.; minimum concrete strength 6,000 psi 28-day; minimum tendon strength 250,000 psi ultimate; initial prestress 175,000 psi; initial prestress 14,000 lbs. per ⅜" tendon; and maximum camber after installation shall not exceed 1½ ins.



● **TYPICAL section through beam, showing 24-in. diameter pipe and reinforcing.**

● **COMPLETED bridge, showing clearance at normal water level. Design provided for flood flow 3 ft. deep over top of bridge, line empty and current at 10 ft./sec.**

Those participating in the design and construction of the beam were: Arthur W. Sweeton, 3rd, chief engineer, Metropolitan District, Bureau of Public Works, Hartford, Conn.; Robert B. Benscoter, chief engineer of Concrete Products of America, Division of the American-Marietta Company of Pennsylvania; Robert W. Loomis, professional engineer, Windsor, Conn.; and Guerrera and Mancini, West Hartford, Conn., contractors.

The transportation of the beam, 31 tons in weight and 65 feet long, from Kenville, New Jersey, to Newington, Conn. was accomplished by a truck and special trailer.

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The Editor, PUBLIC WORKS
200 South Broad St., Ridgewood, N. J.

COUNTY GETS MORE MILES FROM *Its Highway Maintenance Dollar*

EDGAR CONRAD,
County Highway Supervisor,
Harrison County, Indiana

MODERN equipment, good maintenance facilities and controlled operations enable Harrison County, Indiana to maintain three times the usual mileage on the same amount of budget. During 1958 our Highway Department will have an estimated $365,000 to maintain and improve 926 miles of county roads and to purchase new equipment. Like all other county highway departments in the state, our department operates solely on funds from state gasoline taxes and vehicle registration fees. Money is returned on the basis of car registration, and we have a comparatively low registration.

In 1957 we rebuilt 18 miles of roads in addition to normal maintenance. About ten percent of our roads are paved with asphalt, with 15 miles paved last year. During 1958 we plan to rebuild 30 miles of inadequate roads and to pave 20 miles. Almost all of our equipment is less than four years old, and we have a new garage.

Careful attention to make sure every dollar covers the most miles has made this accomplishment possible. First we make sure our roads are the best we can build. Then we keep our equipment in good repair, and we check cost records to make sure we buy equipment that gives us the most for our money. Finally, we have an organization that permits us to do this easily.

Old roads are being brought up-to-date by building an 18-ft. surfacing on a 30-ft. roadway. In most cases, this involves widening the existing roads and building up the shoulders. The finished roadbed is topped with 5 inches of minus ¾-inch crushed rock with fines, which is compacted by traffic. This fine stone packs down to almost concrete hardness, more stable and long lasting than possible with coarser rock. Roadbeds are prepared a year before paving.

To complete this heavy schedule on time, we have to keep our equipment in top condition. In 1955 we built a modern garage in Corydon, the county seat. This 90 x 50-ft. concrete block building includes an office, store room, and a fully equipped shop. We can handle any repair job except the finest machining, such as turning crankshafts. Five large doors provide access to the bays which can handle all of our equipment. This garage will pay for itself within three years through time saved in equipment maintenance and repairs and through discounts on parts.

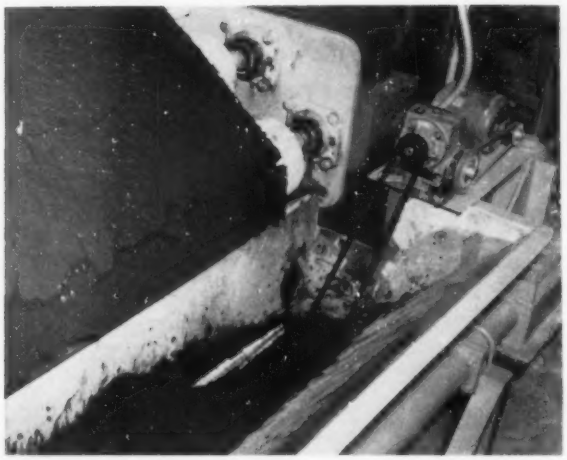
Typical of time-saving techniques employed is our method of fixing flats. We mounted a large air compressor in our pickup for on-the-job repairs. We just loosen the tire on the outside, replace the tube, and inflate it. The grader is rolling again in less than 1/3 the time needed for ordinary procedures.

Cost records are kept on every grader to help guide us in purchasing equipment that provides the least downtime and lowest repair costs. Operators keep track of fuel and oil costs and the mechanic records the repairs; and these records are used as a guide in the purchase of new equipment.

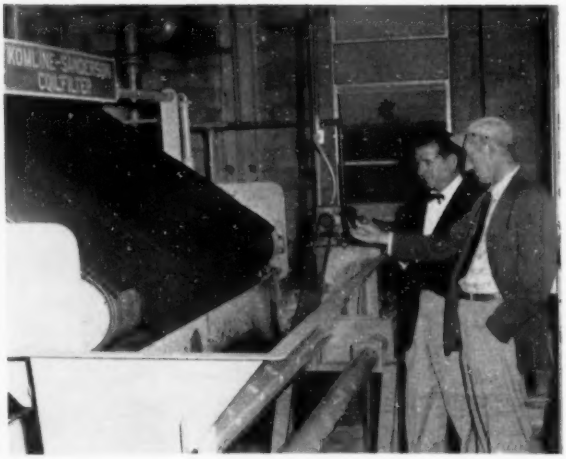
An efficient organization permits us to accomplish these tasks. Our 55 man force is broken up into seven groups—six districts and the garage force. Each of the six districts, headed by an assistant supervisor, has about 160 miles of rough, rolling terrain. The assistant supervisor drives a dump truck and is assigned a motor grader and operator. Construction work is handled by these two machines plus additional equipment from our pool of four dump trucks, two front end loaders, an air compressor, and two maintainers pulled by farm tractors. A flat-top truck is used for bridge repairs and maintenance.

● **GRADER operator Ed LaPlante, left; right is Edgar Conrad, Co. Hwy. Supvr.**

● **CAREFUL maintenance of existing roads is assured by close-knit and efficient organization, including fully equipped garage and the use of time-saving methods.**



● CAKE from Coilfilter is dropped into hopper where packer mechanism delivers it to the conveyor equipment for disposal.



● ANOTHER view of filter, hopper and tubing, with Fred Stuart and the author. Cake is carried to second floor room.

DEWATERED SLUDGE HANDLED BY CONVEYOR

W. C. TIMS
Supt., Division of Sanitary Sewers, Coral Gables, Florida

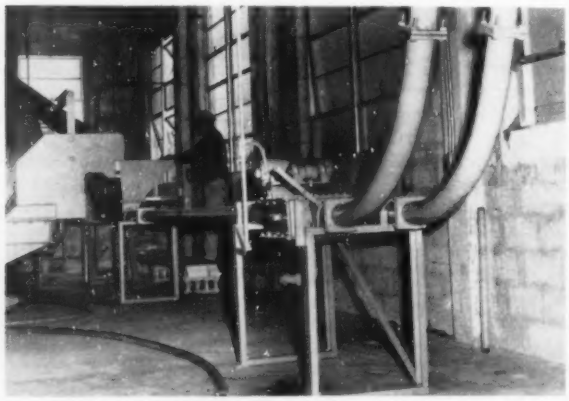
SLUDGE produced at the sewage treatment plant at Coral Gables is dewatered on a vacuum filter, flash dried and sold for fertilizer. The filter is Komline-Sanderson Coilfilter, with 150 sq. ft. of filtering surface (8-ft. dia. by 6-ft. face) which produces a cake with an average moisture content of about 75 percent. This cake is handled by a 4-inch diameter Hapman conveyor from the ground floor to the second floor flash drier, where it discharges to a chute leading to the mixer of a CE-Raymond System flash drying unit. The resulting final product is sold back to the Parks Department at $30 per ton for use as a soil builder for parkways, golf courses and other areas.

The Hapman conveyor was deemed especially adaptable to this installation for two reasons: To conserve space and to insure that no odors escape. The tubes are continuous in both horizontal and vertical positions, taking the filter cake in a continuous flow, so the filter cake is always wholly enclosed en route to the drier. The total length of the conveyor is 64 ft.; the carry or horizontal length is 47 ft.; the vertical lift is 26 ft. on an approximate 30° angle from the vertical at a point 35 ft. from the pickup point at the discharge side of the hopper.

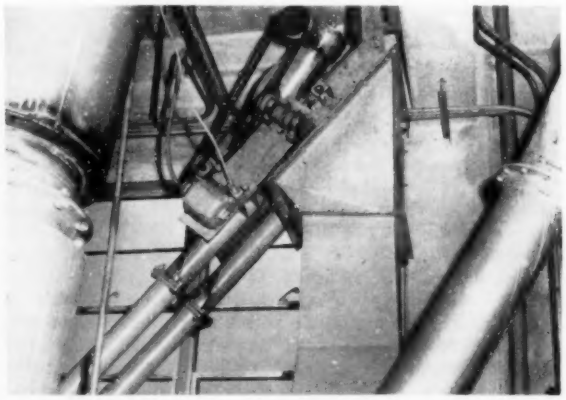
Sludge is filtered on a 6-hour per day basis, two days a week. The weight of the filter cake produced in 6 hours of operation contains, on the average 4456 pounds of dry solids. The conveyor unit was designed to handle 2,450 pounds of filter cake per hour but is able to carry, and has carried, more than 3,000 lbs. per hour. In operation, it was found that drags should be spaced at 12 ins. Also, a packer mechanism had to be installed in the sludge coke hopper so as to feed the cake properly into the conveyor. After more than a year of use it has been found that the installation is very satisfactory, with no odor resulting and with ease of cleaning and maintenance—about 45 minutes per week for cleaning.

Cost data on the conveyor system are not available as all equipment in the filter building—the filter, flash drier, conveying equipment, etc.—was let on a lump sum bid. The changes in the conveyor drag spacing and in feeding were made by the manufacturer without cost to the city.

Smith & Gillespie, Jacksonville, Fla., were the consulting engineers.



● TUBING has total length of 64 ft. with lift of 26 ft. Conveyor is designed to handle 2450 lbs. of filter cake/hr.



● SECOND floor: Conveyor with vibrator on side delivers cake to chute which leads to mixer of heat drying equipment.

STEEP TERRAIN PROMPTS USE OF DOUBLE DECK SEDIMENTATION BASIN

SALT LAKE CITY receives its water supply from six watersheds in the mountains just east of the city. About 25 percent of the city's supply, on a yearly average, comes from the watershed of Big Cottonwood Creek—an area of approximately 50 square miles, noted for its deep-seated springs. The chemical quality of the water is very good, and at certain times of the year, the suspended solids are close to zero. But this picture changes radically with flash floods or quick melting of the winter's snows. With the fast runoff from the mountains, the swollen streams pick up trash, silt, mud, and particles of organic material, increasing the turbidity to as high as 60 mg/L.

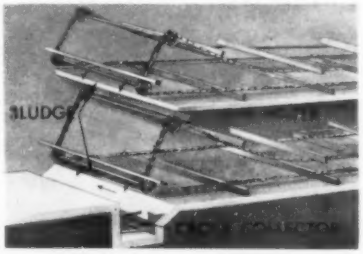
The Big Cottonwood treatment plant is designed to handle 32 mgd through a system of water intake screens, chemical treatment, flocculation and settling tanks. Water entering the city's mains from this plant now has a maximum suspended solids content of 3 mg/L. In the near future the plant will include a filtration system to reduce the solids to near zero.

Link-Belt Company provided the two automatically controlled traveling water screens, Straightline slow mixers for the coagulation basin, and the 16 Straightline longitudinal sludge collectors and two cross collectors for the settling tanks.

The system has two unusual features. The longitudinal collectors are installed on two decks in the tanks, one above the other, reducing by one-half the area required for this portion of the system—an important point because this plant is situated in a narrow canyon bottom. The settling tanks are completely covered to protect the water from possible contamination from dust and dirt and also to prevent freezing over during cold weather.

Chemical treatment consists of coagulation with alum and hydrated lime, aided by activated silica. For taste and odor control and color adsorption, activated carbon is used. Following flash mixing, the water enters two coagulation basins, each 57½ ft. long, 72 ft. wide, with an average depth of 15½ ft. Each basin has five rows of Straightline slow mixers, with four assemblies of redwood paddles to a row. The paddles are bolted to steel angle irons which are clamped to solid steel shafts arranged parallel to the flow in the chamber.

Coagulation and flocculation is followed by sedimentation, in parallel tanks, each 72 ft. wide and 304 ft. long, equipped with a total of 16 Straightline longitudinal sludge collectors and two cross collectors. In the double-deck arrangement, one cross collector serves the four upper and four lower longitudinal collectors in each tank. The detention time is about three hours. The longitudinal sludge collectors, which consist of a double strand Promal chain with 3 by 8-in. redwood flights at 10-ft. centers, travel at a rate of 2 fpm along the bottoms of the tanks. The cross collectors, which are similar except that the flights are spaced at 5-ft. centers and operate at 3 fpm, gather the sludge from the 16 longitudinal collectors.

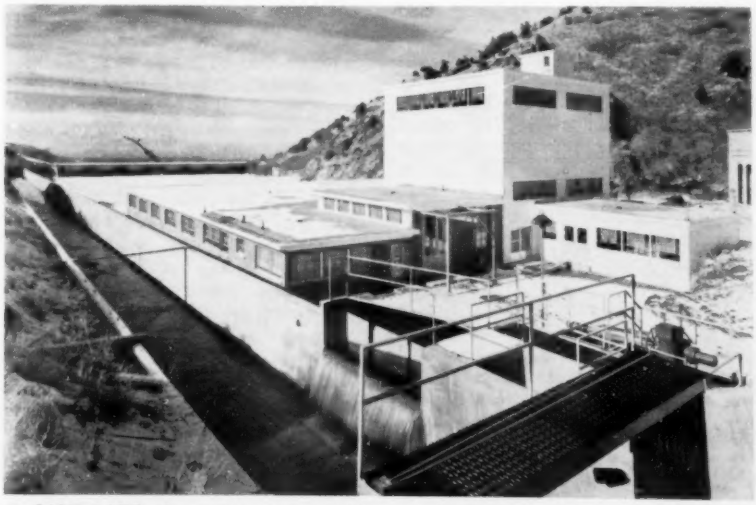


● **DOUBLE-deck arrangement of the 16 longitudinal collectors reduces by one-half the area required for the plant.**

The creek flow at present is normally 13 to 14 mgd; however, at times it reaches 200 mgd. Since the plant can handle only 32 mgd, consideration is being given to the construction of a dam which would store the flow during peak periods to create a reserve to supplement low creek flow.

The plant was placed into operation in December, 1957. It was designed by John A. Carollo and Associates, Phoenix, Ariz. Talboe and Harlin Construction Co., Salt Lake City, served as general contractor. Grant M. Burbidge is city commissioner and directly in charge of the Salt Lake City water department. Charles W. Wilson is superintendent, and Roy W. McLeese is city engineer.

Photos were made for Link-Belt Company by Hal Rumel, Salt Lake City.



● **SALT LAKE plant: Screening, addition of chemicals, flocculation and settling provide satisfactory treatment for the present but filters will be installed later.**

EVERY CITY Should have an Economy Survey

C. A. CROSSER*

THERE ARE 300 ways by which the City of Seattle could make savings or increase revenues totaling about $3,000,000 a year. There are 1,099 ways by which the City of Milwaukee could better its finances by savings and improvements in its operations.

These were the findings by two different survey firms after investigations of the operations of these two cities by their staffs of specialists. Some have already been put into effect. Others are under consideration by city officials and citizen committees. The Milwaukee survey was made in 1949 by Griffenhagen and Associates. Out of 1,099 original recommendations, more than 600 have been put into effect with an estimated savings of about $1,300,000 a year. The survey cost $50,000. The Seattle survey was made in 1957 by Booz, Allen and Hamilton. By the end of 1957, more than 50 of the 300 recommendations were effected for a savings or additional revenues of nearly $400,000 as compared with the $104,000 cost of the survey.

Citizens and city officials who were close to these two surveys are convinced that they were worth many times their cost in direct savings besides a number of beneficial indirect results. Several important lessons can be learned from these two surveys from which every large and small city in this country can profit.

Both Seattle and Milwaukee are well operated cities, as the surveyors pointed out. "Shucks. We've got a well run city. Why waste money on a survey?" was the tenor of comment by some officials in both cities. But despite the high quality of administration in both of these cities, the survey firms found plenty of opportunity for improvement.

Therefore, it can be categorically stated that any city, well or poorly run, can profit from an appraisal by competent investigators. The findings might range from a limited number of improvable procedures in well run cities to numerous wastes in poorly run cities which can be ascertained as easily as shaking overripe apples from a tree.

Here is another lesson from the Milwaukee and Seattle surveys. Too frequently, city officials have found that these surveys, when completed, have been "too hot" to touch because of their sharp recommendations. So, city officials have given them file numbers and with relief have consigned them to burial in the city clerk's vaults.

But the Milwaukee and the Seattle surveys were handled differently to make certain of their usefulness. In both, the mayors and councils appointed blue-ribbon committees consisting of citizen representatives from potent groups, a few members of the city council and other city officials. The sole goal of these committees was to make sure that the unfulfilled surveys did not die. They were supposed to review the survey firm's recommendations and make sure that the desirable ones were put into effect.

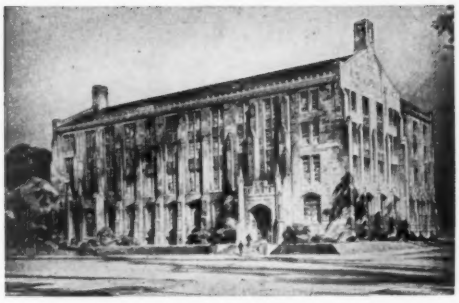
Here is the pattern of the Seattle city survey which could be imitated by any community. In the summer of 1956, Seattle's youthful and energetic Mayor Gordon S. Clinton, with the assent of the city council, appointed the Citizens Administrative Survey Committee of 18 members. The chairman was Donald H. Yates who was former president of the Chamber of Commerce and of the Seattle Municipal League and a former member of the City Transit Commission. Assisting him were the comptrollers of the Boeing Airplane Co. and the Seattle Times; a retired Monsanto Chemical Co. executive; representatives of labor and the League of Women Voters; the secretaries of the Chamber of Commerce and the Seattle Municipal League; the mayor's administrative assistant; the president of the City Council and the chairman of its finance committee; the secretary of the Civil Service Commission; and the council budget officer. This offered a nice balance between lay groups and official agencies.

The committee's first job in the fall of 1956 was to select the survey firm. In response to invitations to submit proposals, about a dozen firms which appraise public agencies offered their services. After studying the background of these concerns, the committee selected the firm of Booz, Allen and Hamilton of Chicago, partly because of their experience in investigating public agencies and also because of their many surveys of private corporations. It was felt that this exposure to the procedures of large private enterprises could result in the transplanting of some of their practices into the city's operations. The contract authorized by the city council called for the payment of $104,000 by the city to this firm in return for which it would analyze the $85 million annual expenditure by the City of Seattle and the city-owned City Light and Water Departments, involving about 7,000 employees. Because of councilmanic antipathy to the council-manager plan, the firm was not to recommend changes in the basic governmental structure of the city.

(*Continued on page* 110)

*Mr. Crosser is executive Secretary of the Municipal League of Seattle and King County, and has served as a member of Seattle's Citizens Administrative Survey Committee.

News BULLETINS



AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Herrick Honored at Meeting of Chicago Metropolitan Chapter

Chicago, Ill.—Over 200 members and guests turned out for the annual spring meeting of the Chicago Metropolitan Chapter at the Midwest Country Club in Hinsdale on Tuesday, May 20. The afternoon was devoted to the Chapter's annual golf outing, while the dinner meeting featured a salute to Donald F. Herrick, retiring Executive Director of the APWA.

Lloyd M. Johnson, Commissioner of Streets and Sanitation for the City of Chicago, who was President of the APWA when Mr. Herrick assumed the post of Executive Director, presented to him a Resolution on behalf of the Association's Board of Directors, expressing its sincere appreciation for his devoted service to the APWA during the past twelve years. Robert L. Anderson, Superintendent of Public Works of Winnetka, and Past President of both the chapter and the APWA then presented Mr. Herrick with a portable short-wave radio on behalf of the Chicago Chapter.

A. W. Konefes, Superintendent, Bureau of Equipment Service for the City of Chicago, and President of the Chapter presided at the meeting which was also highlighted by the election of officers and a very entertaining talk by David Condon, Sports Editor of the Chicago Daily Tribune.

The new slate of officers is headed by William Smaha, Administrative Assistant, Brookfield. Armon Lund, Superintendent of Public Works of Wilmette, was elected First-Vice President and William Harte, Assistant Superintendent of Sanitation of Chicago, was named Second-Vice President. Charles V. Sramek, Ward Superintendent of the City of Chicago, was re-elected Secretary-Treasurer of the Chapter. Numerous golf and door prizes were also presented at the close of the meeting.

APWA's New Executive Director

Robert D. Bugher, who takes over as Executive Director of the APWA on July 1, 1958, has been on the Association staff for the past five years.

Willis Named First President of Association's Newest Chapter

Pittsburgh, Pa.—The initial meeting of the Western Pennsylvania Chapter was held at the University of Pittsburgh's Schenley Hall, May 15, with William Willis, Director, Institute of Local Government of the University of Pittsburgh, presiding, Donald C. Stone, Dean of the Graduate School of Public Affairs and Honorary Member of APWA gave the welcoming remarks. Robert L. Anderson, immediate past president of APWA was guest speaker. Afternoon technical sessions included a presentation on current refuse collection practices by Leo Weaver, Director of Research, APWA, and a general discussion of public works problems by the group.

Chapter officers elected for the year 1958-59 were William Willis, President; R. B. Steytler, City Engineer, Erie, Vice-President; and George Illig, Calgon Company, Secretary-Treasurer. Elected to the Executive Committee were Robert Perry, City Engineer, Meadville; Harry Penny, Director, Department of Streets and Public Improvements, Altoona; J. Henry Quirk, City Engineer, Bradford; and Leland Webster, Street Commissioner, Warren.

Hayden Elected President of Up-State New York Chapter

Rochester, N. Y.—The spring meeting of the Upstate New York Chapter was held in Rochester, May 11-13, 1958. A welcome to Rochester was extended to the 80 participants by Mayor Peter Barry. City Manager Robert P. Aex presented the story of "Civic Progress in Rochester" at the annual banquet.

The technical program featured soil stabilization, refuse collection practice, and a general session on public works problems. H. Walter Hughes moderated the panel on soil stabilization which included G. Armstrong, International Salt Company, George G. Hayden, Portland Cement Association, H. C. Bower,

OFFICERS: Sol Ellenson, Newport News, Va., *President;* Wm. D. Hurst, Winnipeg, Manitoba, Canada, *Vice President.* REGIONAL DIRECTORS: (term ending 1958) Jean L. Vincenz, San Diego, Calif.; Leo Flotron, Dayton, Ohio; Roy W. McLeese, Salt Lake City, Utah; (term ending 1959) Albert G. Wyler, New Orleans, La.; Edward J. Booth, Bismarck, N. D.; Frederick Crane, Buffalo, N. Y.; (term ending 1960) Charles W. Cooke, Hartford, Conn.; R. S. Hopson, Richmond, Va.; H. H. Hester, Fort Worth, Texas. *Immediate Past President,* Robert Anderson, Winnetka, Ill. Robert D. Bugher, *Executive Director*

American Bitumuls and Asphalt Co.; and J. W. Sutterby, Seaman-Andwall Corporation. Rochester's Director of Public Works F. Dow Hamblin moderated the session on refuse collection practice in which Leo Weaver, Director of Research, APWA participated. Shirt sleeve sessions on various public works problems followed by a tour of public works installations in Rochester wound up the meeting.

John V. Lewis, Director of the Bureau of Maintenance was General Chairman of the Convention Committee. President A. R. Karkkainen presided at the business meeting. Joseph F. Hayden, Commissioner of Public Works, Troy, was elected President; Francis J. Laverty, Superintendent, Department of Public Works, Ithaca, Vice-President: and A. H. McCaffrey, Commissioner of Public Works, Amsterdam, New York, Secretary-Treasurer for the year 1958-1959.

Northern California Members Hear Talk on Public Works Management

Berkeley, Calif.—The May meeting of the Association's Northern California Chapter was held in Berkeley with President Olof E. Anderson presiding. One of the highlights of the luncheon meeting was the election of officers which placed Karl G. Heine, Superintendent of the Division of Construction and Engineering for the Pacific Telephone and Telegraph Company, at the helm. Marvin Anaya, Deputy City Engineer of Pittsburg, was named Vice President, and Lee J. Rothgery, Associate Engineer of the University of California's Institute of Transportation and Traffic, was elected Secretary-Treasurer.

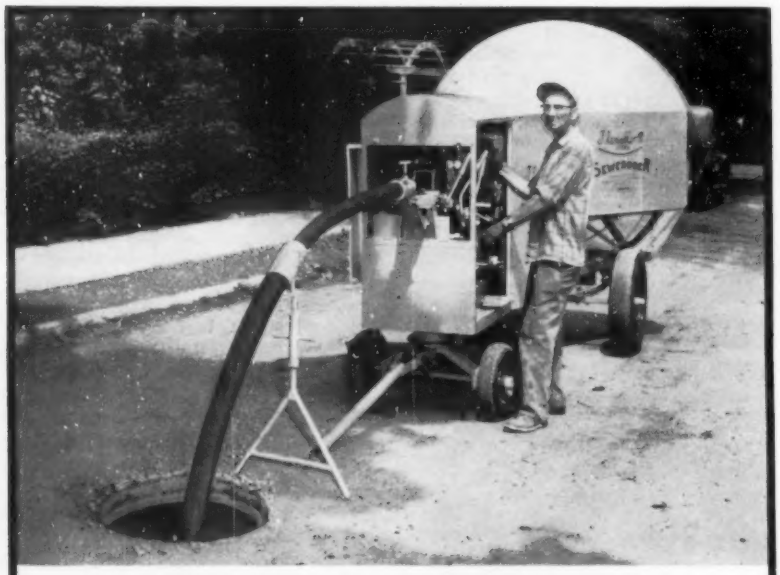
The guest speaker was Earl R. Strathmon, Administrator for Alameda County, whose topic was "Public Works Management". He pointed out that some turnover in employees is very desirable. "Large organizations", he said, "should have a 15 to 17 percent turnover with top and lower level employees." Strathmon also suggested that new employees be interviewed at the time of employment in order to determine their general interest. Then, six months later the new employee should be interviewed again in order to learn what his thinking has been on specific problems.

Public Works Director H. G. Crowle, of Alameda County, also gave a very interesting impromptu talk on his recent experience at the Capitol in Washington, D. C., before a sub-committee of the Senate and the House in regard to Flood Control Problems which pertain to Alameda County.

Wisconsin Chapter Meeting Attracts Record Attendance

Wauwatosa, Wisc.—A total of 74 members and guests attended the annual meeting of the Wisconsin Chapter at Wauwatosa's beautiful new municipal building on May 15 and 16. Chapter President F. D. Kuckuck, Director of Public Service for the host city, presided at the meeting.

Mayor William B. Knuese welcomed the delegates to Wauwatosa at the opening session. The program included a complimentary luncheon, informative talks on public relations, economics of sewer design and special assessments. It was also highlighted by a business meeting featuring the election of officers and a most enjoyable dinner at one of Milwaukee's finest dining spots. Participating on the program were: Elmer A. Worgull, Milwaukee Gas and Light Company; Walter P. Schmitz, Engineer-In-Charge, Sewer Construction Division, Dept. of Public Works, Milwaukee; and Robert



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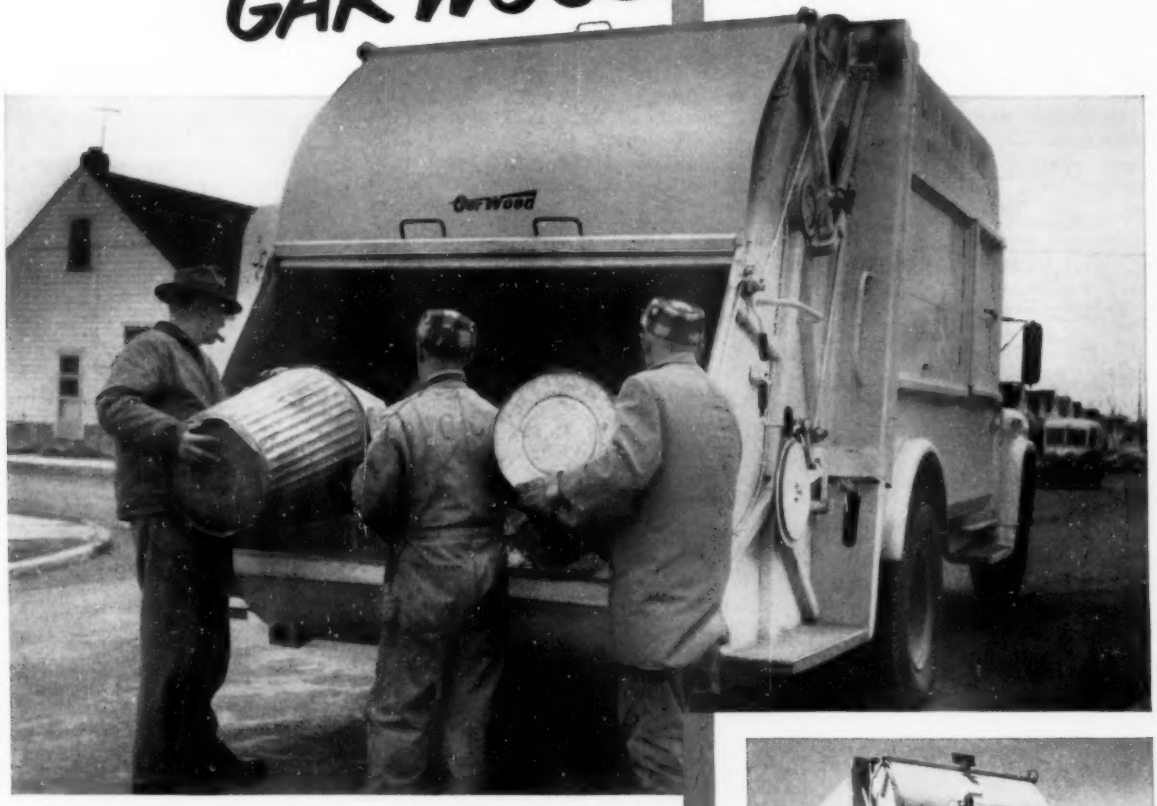

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Sundby, Attorney, Wisconsin League of Municipalities. APWA Regional Director, Leo Flotron, Chief Highway Engineer of Dayton, Ohio, was among the guests in attendance.

The officers elected for the 1958-59 term were: Robert E. Fleischer, Director of Public Works, Sheboygan, President; Wm. J. Chadwick, City Engineer, Racine, Vice President; and John G. Thompson, City Engineer, Madison, Secretary-Treasurer. Others elected to the Executive Committee were: Ivar Van Akkeren, City Engineer, Oshkosh; Edwin J. Duszynski, Director of Public Works, Appelton; E. C. Bennett, City Engineer, Beloit; and W. J. Blong, Village Manager, Fox Point.

Meeting of N.Y.-N.J. Metropolitan Chapter Features Visit to Incinerator

Town of Oyster Bay, N. Y.—The Spring Meeting of the New York-New Jersey Metropolitan Chapter, for which the Town of Oyster Bay, Long Island, New York was host, drew a record attendance with a registration of about 425 members and guests. 32 manufacturers and dealers sponsored exhibits of equipment. The all-day meeting included luncheon, informative talks, field trips, a cocktail hour and dinner. Town Supervisor John J. Burns was meeting chairman.

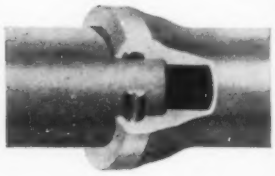
In the absence of Chapter President Casimir Rogus due to illness, August Zentgraf, vice president, presided. The technical program featured two speakers: W. Fred Welch, Senior Hydraulic Engineer, Nassau County Department of Public Works presented an illustrated discussion of public water supply and conservation measures; and William Raisch, consulting engineer, described the 500-ton incinerator recently completed for the Town of Oyster Bay. These talks were followed by field trips, one to the new Operating and Control Center of the Long Island Lighting Company, and the other to the incinerator. This installation includes its own power generating equipment which utilizes waste heat to operate all facilities, stringent control of smoke and fly ash emission, and an unusual water carriage ash removal system consisting of a sluiceway through which water is recirculated, an ash pit, clarifier and holding reservoirs.

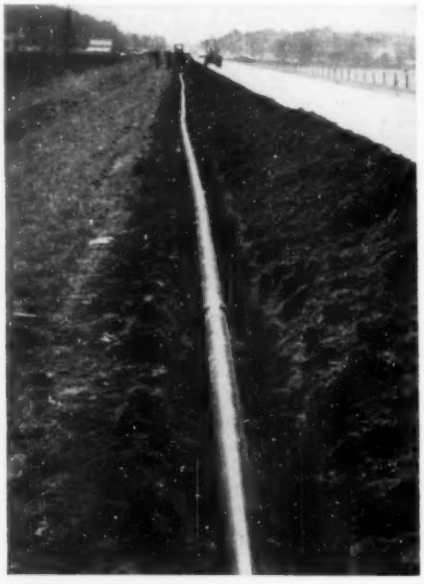
Thomas R. Pynchon, Supt. of Highways for the Town of Oyster Bay was in charge of program planning and John C. Martling, Deputy Supt. of Highways was in charge of the exhibits.

Ohio Chapter Holds Spring Meeting in Columbus

Columbus, Ohio—Some fifty members of the Ohio Chapter attended an all-day meeting held at the Youth Center of the Ohio State Fairgrounds, Columbus, May 20. The meeting included two sessions, the second being an afternoon refuse clinic and equipment display sponsored by the chapter. The State Department of Health, the Ohio Municipal League, The County Commissioners' Association of Ohio, Ohio Township Trustees Association, Ohio Public Health Association and the Ohio Association of Public Health Sanitarians.

The morning session featured talks and discussion on the selection, care and maintenance of trees, planting and grasses on city streets and expressways. Speakers included Charles Wedekind, Resident Consultant, E. H. Scanlon and Associates; Dr. Kenneth Albans, Department of Agronomy, Ohio State University; and Wilbur J. Garmhausen, Chief Landscape Architect, Landscape Section, Ohio Department of Highways. Robert F. Werner, City





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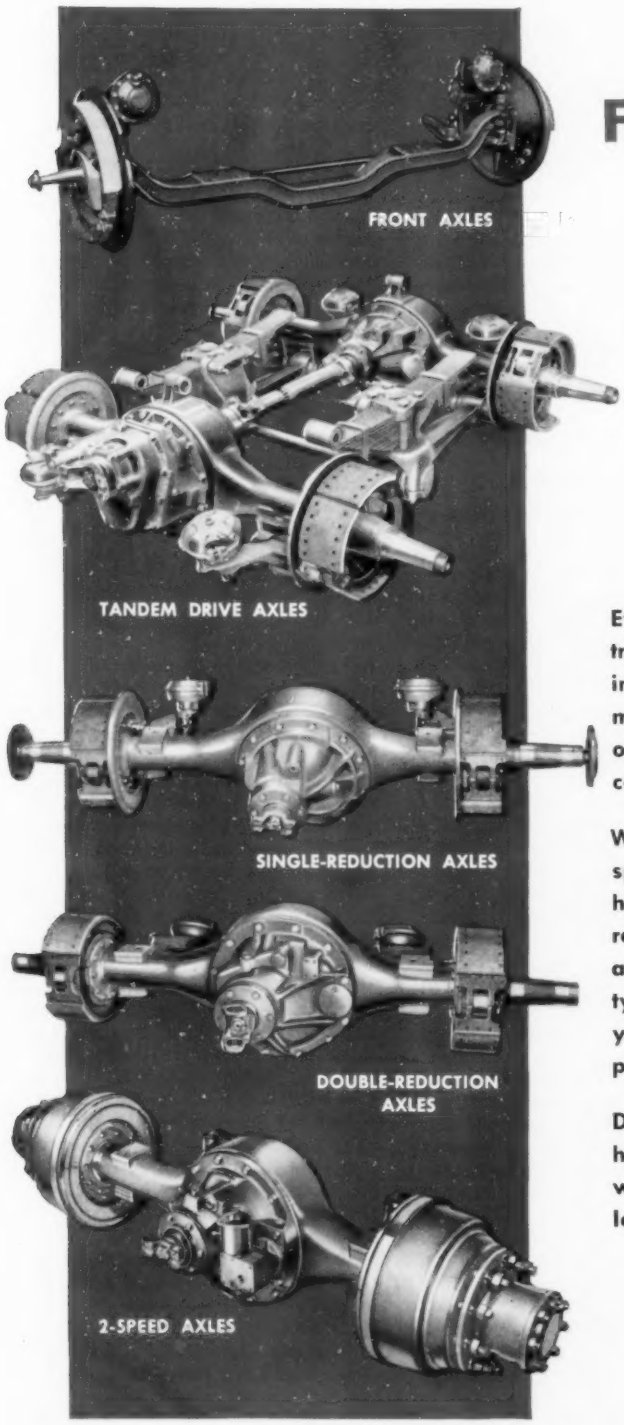

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and the RIGHT AXLE on the Truck!

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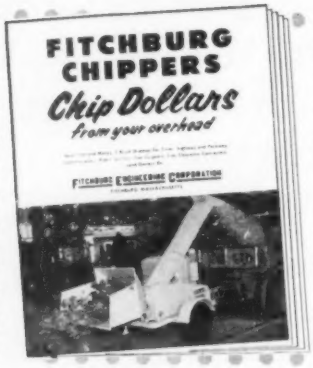

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Engineer, Columbus, presided over the morning session and the address of welcome was delivered by Floyd C. Reddick, Director of Public Service, Columbus.

At the pre-luncheon business session Fred Hughes, Superintendent of the Public Works Division, Springfield, was elected President; William Wichman, Director, Department of Public Works, Cincinnati, Vice-President; and Jack Unterberger, Engineer in Public Works, Dayton, Secretary - Treasurer for 1958-59. Louis L. Drasler, William J. Gross, and C. A. Boeke, Directors of Public Service for Cleveland, Toledo and Middletown, respectively, were elected Directors.

The afternoon jointly sponsored refuse clinic session was introduced by Robert Werner and F. H. Waring, Chief Engineer, Ohio Department of Health. George H. Eagle, Ohio Department of Health, served as chairman of a panel presentation by W. A. Hardenbergh, Editor, PUBLIC WORKS, Ralph C. Taylor, Superintendent of Waste Collection Division, Cincinnati, Leo Weaver, Director of Research, APWA, Chicago, and Elroy Spitzer, Engineering Editor, American City Magazine. Over 200 attended the afternoon session

MUNICIPAL OUTDOOR SWIMMING POOLS

DAVID J. KENNEDY
Research Assistant
League of Minnesota Municipalities

A SURVEY of municipally-owned outdoor swimming pools in Minnesota has been made by the League of Minnesota Municipalities. Questionnaires were sent to 50 municipalities of which 46 responded; 36 municipalities answering had pools.

Of the 36 pools, 32 are of reinforced concrete; two are of steel; one is brick-lined; and one has a ceramic tile lining. Most of the pools reported are of the standard rectangular shape, the most popular size being about 120 feet by 50 feet. Many recent pools have irregular shapes, which makes possible the separation of the diving area from the main body of the pool. Fifteen pools have underwater lighting and seven have both underwater and overhead lighting.

All but three of the pools employ re-circulation; three use the "flow-to-waste" principle; many use this method, however, in the wading pool. Both chlorine and soda ash are used in the treatment of water in nine pools, and all use chlorine in either the gas or hypochlorite form. For filtration, 12 pools have sand or gravel filters and 15 use diatomite filters.

Only two pools (Minneapolis and the South St. Paul, North Pool), provide artificial heating of the water. The temperature maintained is 72 degrees.

During the winter months pools are generally drained, and in many instances, a layer of flax straw is added for protection. Four pools (Glencoe, Kenyon, Le Center and Pine Island) are filled partially with no adverse effects reported. None of the pools is used for skating during the winter.

The average pool is open 60 hours a week. There is no charge for suits, lockers or towels in 12 municipalities, and the usual fee where a charge is made is 25 cents for suits, 10 cents for locker or basket, and 5 cents for towel. The highest charge for suit rental is 35 cents. All pools reported employing at least two lifeguards, and the average number employed is four.

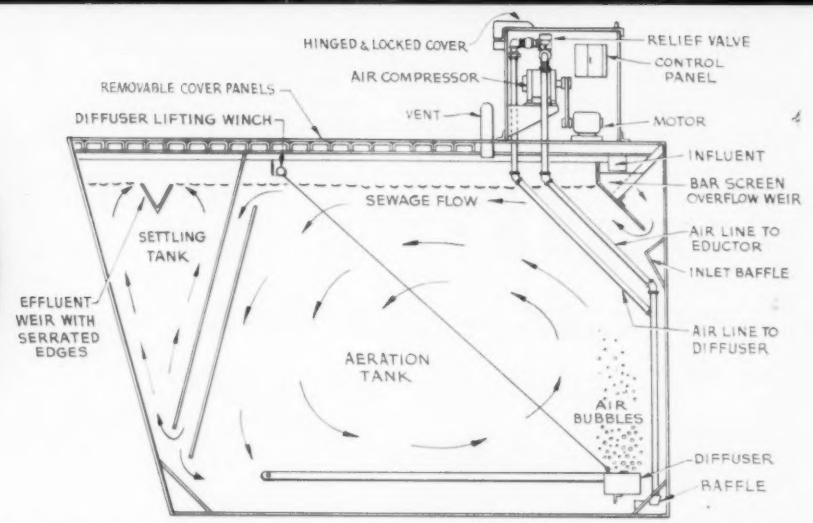
Judging from the number of municipalities that offered information about their wading pools, it appears that any future survey should include some questions on them. Wading pools, either as adjuncts of the main pool, or entirely separate from it, are in use in seven communities.

Based on the 1950 population, it appears that pools in municipalities in the 1,000-5,000 range cost between $3,000 and $7,000 to operate, and those in the 5,000 to 10,000 range, between $7,000 and $12,000. Operating loss, the excess of expenditures over receipts, varies considerably. Several municipalities reported that the cool summer last year caused a sharp decrease in paid attendance. Generally, only one-third to one-half of the operating expenses in 1957 were recouped from fees with the remaining costs financed from general funds. Further, since this survey reflects only costs for one year, expenditures for major repairs and improvements distort the cost figures in some cases.

A significant development in the financing of pools built in the post-World War II years is the increased use of gifts and citizen contributions. Eight pools built in the period 1947-1957 were partially financed in this manner.

The Smith & Loveless * APPROVED FACTORY-BUILT SEWAGE TREATMENT PLANT

Specify SMITH & LOVELESS "OXIGEST"



Smith & Loveless offer the low cost "Oxigest" sewage treatment plant for sub-divisions, schools, motels and industrial plants. The "Oxigest" is designed and built with the same care and precision that have made the Smith & Loveless factory-built sewage lift stations so widely accepted and specified.

The "Oxigest" has been carefully engineered for dependable treatment without requiring a skilled operator.

Completely protected by Smith & Loveless "Versapox" coating and magnesium anodes.

Built of the finest materials, the "Oxigest" will provide a permanent plant with minimum annual maintenance.

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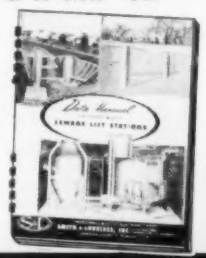

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REPRESENTATIVES IN PRINCIPAL CITIES

Of the pools reported, 18 were built in the past five years, and four of the municipalities reporting no pools stated that they are planning construction of one in the very near future. This, combined with the fact that many other pools are undoubtedly in the planning stage, indicates that the municipal outdoor swimming pool is rapidly becoming an institution in Minnesota. Further, the fact that 10 of the pools built in the past five years were constructed at a cost of at least $100,000 and as high as $200,000 suggests that a municipal swimming pool, with its recreational and educational assets, is, in the judgment of many municipalities, worth a substantial investment. From *Minnesota Municipalities.*

• • •

Economy Surveys

(*Continued from page* 102)

Also the job was to be completed in the six months between Jan. 1, 1957 and June 30 which proved to be a slight point of weakness because it hurried the surveyors. The council wanted the survey to be completed in time to use some of its recommendations in the 1958 budget.

The survey firm assigned a group of eight staff members to the preparation of the report. Included were two former city managers and others who had had city hall experience. Mayor Clinton assigned a member of the Civil Service staff to assist the surveyors in meeting city officials and in obtaining statistics. The latter followed a definite routine of contacting department heads and subordinates, inquiring about their procedures, noting weaknesses, and contriving improvements based on the successful experiences of other cities and private corporations.

During the spring of 1957, members of the survey team, as they completed their scrutiny of each department, met with the Citizens Committee or one of its subcommittees assigned to some municipal service, and tried out on them their findings and recommendations. The latter, because of their knowledge of local findings and customs, made suggestions which in some cases resulted in a modification of the recommendations by the surveyors.

The job was completed on schedule. High-lights of the report were then presented by the surveyors to a conference consisting of the members of the Citizens Committee, Mayor Clinton, the city councilmen, about 20 department heads, and representatives of the press and radio and television stations.

How did these and the community generally take to this report? As for officialdom, how would a housewife react to having someone come into her kitchen and list the things she is doing wrong? They reacted in much the same way. A few hated it to pieces and said so openly. Some restrained their animus but knifed it quietly. Many other department heads honestly tried to hold an objective view about the changes recommended in their own activities, and recognized some of their own long-sought ideas which they themselves had transmitted to the surveyors.

Mayor Clinton and most of the council members were enthusiastic about the report although they didn't agree with all the recommendations. It had a good press. Both large daily papers printed commendatory editorials about it.

Copies of the report were put up in palatable form for the mayor, council and Citizens Committee. A complete report consists of ten volumes of about 100 pages each. Each volume deals with one department, and each contains a list of the savings, improvements or additional revenues recommended for that city

STANDARD STEEL "S-J"
Maintenance Distributor

for VERSATILITY — EFFICIENCY — ECONOMY

HANDLES ASPHALT OR TAR—FOR PATCHING—SEALING—RESURFACING—CRACK FILLING—OR SURFACING DIRT OR GRAVEL ROADS

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Standard Steel S-J Maintenance Distributor, designed specifically for jobs where the use of bigger equipment is costly and impractical, can be moved rapidly from one location to another for patching, shoulder repair or construction of secondary roads . . . It is equipped with suck back spray bar which permits closing of the discharge valve and pulling back all surplus material in the spray bar and piping for quick cleaning . . . All piping and valves are flanged to permit easy repair or replacement . . . The draw off valve is on curb side for safety . . . and coilless self-generating burners are standard equipment as well as a Viking special asphalt pump which can be completely drained, eliminating the necessity for thawing when the unit is started cold. Write for complete details on Model S-J.

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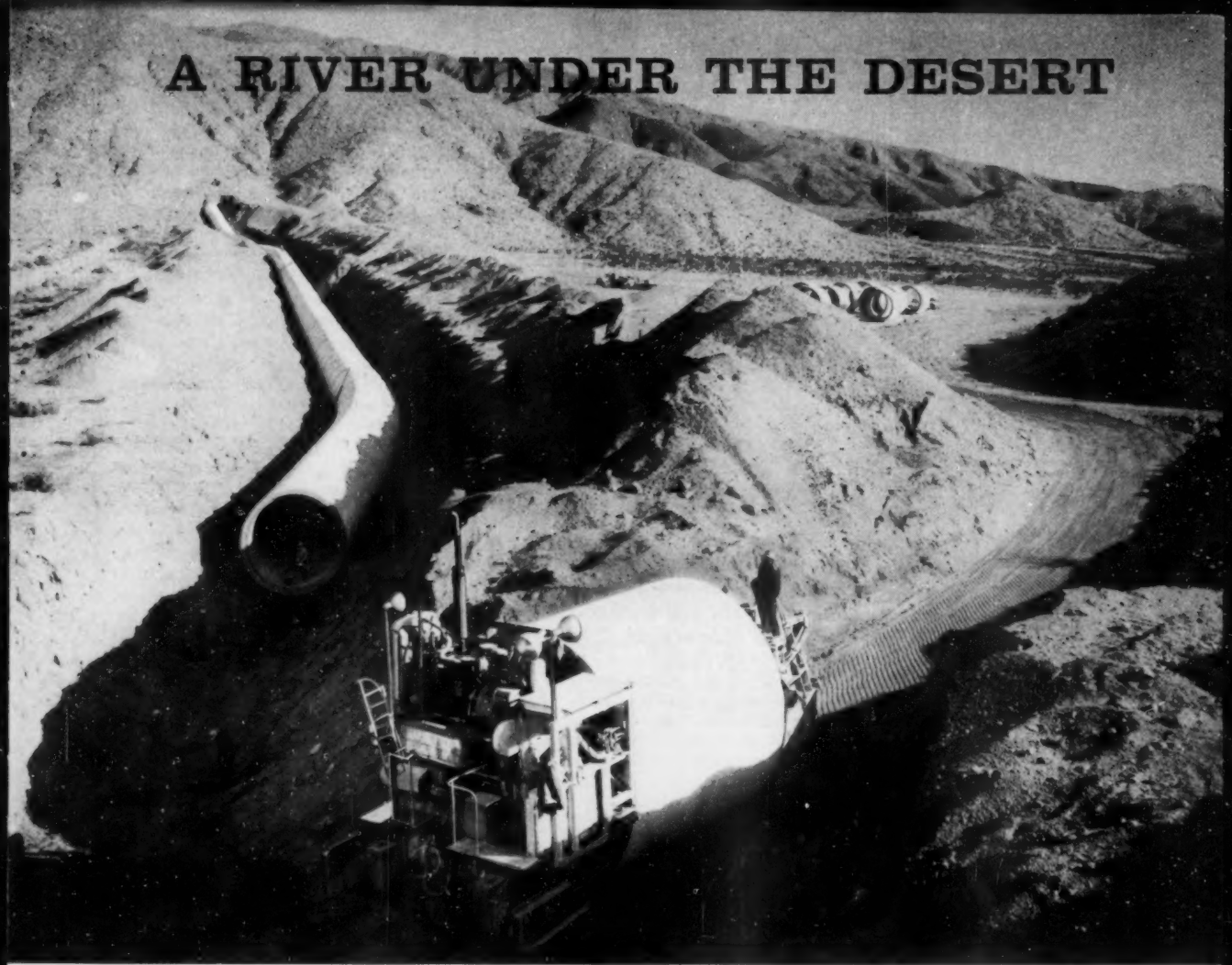
A RIVER UNDER THE DESERT



American Pipe and Construction Co. is engaged in the manufacture and installation of 63,000 ft. of reinforced concrete pipe for 47 inverted siphons of the Colorado River Aqueduct. The siphons, widely spaced along a 183-mile segment of the aqueduct, are part of the program of the Metropolitan Water District of Southern California to bring the gigantic water supply line to full planned delivery capacity of over a billion gallons of water per day.

American's solutions to the remote location and magnitude of the project include the establishment of two on-the-project manufacturing plants. Hauling of 13 ft. 6 in. diameter 68-ton sections of pipe is being accomplished with specially designed 99 ft. trailer-rigs. Approximately 180 miles of access roads are to be constructed before the job is completed in December, 1958. American designed and built the machine shown above to meet special installation problems posed by trenches 125 ft. wide and 50 ft. deep, with slopes up to 50%. This unique "Pipe-mobile" actually carries and installs the pipe.

Today, American Pipe and Construction Co. is more than ever capable of handling problems involved in long-distance transmission of large volumes of water. Fifty years of experience and extensive production facilities are available to help solve any water supply or transmission problem.

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Project plants, such as this one located near Desert Hot Springs, California, incorporate all essential manufacturing operations of permanent plants and bring greater economy and coordination to such large projects.

CONCRETE PIPE FOR MAIN WATER SUPPLY LINES, STORM AND SANITARY SEWERS, SUBAQUEOUS LINES

service together with the means for putting them into effect, by departmental order, charter change or amendment of the state law. These are reinforced by easily-read explanatory comments containing supporting facts and arguments.

After commenting that Seattle is a well run city, the report listed 300 possible savings, improvements and additional revenues which, if put into effect, could improve the city's financial status by about $3,000,000 a year out of a total annual city and light and water utilities budget of $85,000,000. Space doesn't permit going into detail about the recommendations. So we give only illustrations of different types.

The survey started off with recommendations which would strengthen the power of the mayor. The now elected city treasurer, corporation counsel and comptroller would be appointed by the mayor and confirmed by the city council. The planning, civil service and park departments would be separated from their respective commissions and placed under the chief executive. The commissions would be left with advisory powers. The mayor's cabinet would be reduced from about 20 department heads to eight.

Sweeping changes were recommended in the public works and utilities fields. The separate city-owned light and water departments would be joined under a director of utilities. Thus, many of their present duplicate procedures such as promotion, accounting, meter-reading and billing would be integrated at a substantial saving.

Engineering, sewers, streets and bridges would be centralized under a director of public works. An unusual change was the recommendation that the Parks and Recreation Department be relegated to a division of the Public Works Department so that its many engineering, planning, construction and maintenance activities might be integrated with those of the parent body.

A complete centralization of the repair, maintenance, and dispatching of the motor vehicle fleet, and the many other types of city repair shops, was recommended, as was a study of possible integration of police and fire activities in residential areas.

Another major recommendation was for the creation of an Administrative Department in charge of a Chief Administrative Officer who would supply the mayor with much-needed assistance. This is patterned after similar offices in a number of large cities which is thought by some to provide the benefits of the city manager plan. He would aid the mayor in scrutinizing departmental performance records, preparing annual budgets, expediting the complaint procedure, handling personnel problems, publishing the annual report and coordinating department publicity.

Besides the above recommendations for structural changes, there were scores of others which could be installed immediately to save money. Here are a few: City Traffic Engineering Department employees were winding the 6,000 parking meters every three days when they need winding only every 10 days. Water meters are read by a large corps of employees monthly but bills are sent out quarterly. The water and light bills could be sent out on one sheet instead of by two separate mailings as at present. The city is paying about $70,000 more a year to the state for its industrial insurance than its accident experience justifies. The County-City Health Department is giving inoculations to travellers bound for foreign lands for much below cost.

As a check on the surveyors' report, the four subcommittees of the Citizens Survey Committee next

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took over the recommendations, discussed them with department heads, formulated their own decisions about them and transmitted their views to the main committee. The latter reviewed the subcommittee findings and affirmed, modified or rejected them. It turned down only a small number. The findings were compiled in one volume and transmitted to Mayor Clinton and the City Council in a formal ceremony.

What have been the direct or indirect results from this survey of Seattle's municipal operations? Shortly after the conclusion of the survey, the City Council included in the 1958 city budget about 15 of the recommendations which resulted in a savings of additional revenue totalling about $350,000 which is more than three times the costs of its preparation. By the end of 1957, about 50 recommendations either had been put into effect or were in the process of installation.

Solicitous that the Survey should not die, Mayor Clinton urgently requested the Citizens Survey Committee to stand by and be prepared to assist him and the City Council in putting other recommendations into effect.

Milwaukee is a step ahead of Seattle in putting into effect its survey recommendations. In December, 1955, the Common Council created the Special Committee on Organization and Methods composed of six laymen, some of whom served on the original citizens survey committee, and seven aldermen. This group met bi-weekly to study the undisposed of recommendations and decided whether or not they should be carried out. It has also suggested some improvements which were not included in the Griffenhagen survey.

Turning back to the Seattle survey, we find it had several other beneficial but indirect results. City departments appear to be more efficiency conscious. Frequent requests come from them to the City Council to authorize some improvement coupled with the reminder that it was recommended in the survey. Here is another even greater indirect benefit. This 10-volume survey with its 300 recommendations provides the Municipal League of Seattle and King County, a citizens organization, with a how-to-do-it manual for improving their city government on which its committees can work for the next 10 years. Even after it has lost its momentum in city hall officialdom, the League will be pushing for the installation of many of the recommendations.

Here is a pitfall which cities should avoid when they contemplate an appraisal of their activities. There is quite likely to be a clamor to employ some local individual or firm to make this survey. Unless this local concern has had an extensive experience in this appraisal work and can produce a substantial number of reports of other cities which it has surveyed, it would almost be a waste of money to employ it. This is a job which demands specialized experience or it is likely to be barren.

Mounting municipal taxes and mushrooming public expenditures have reached a level where they really hurt. Acquisition of essential family needs and services now is too frequently delayed because of the inflexibly scheduled payments of local and federal taxes. The only solution is to provide the same public services at a lower cost. This can be achieved by means of a careful investigation of the present operating procedures of the city, county or school governments to search out the wastes and weaknesses which then can be remedied by the application of practices which have been found to be successful by experience elsewhere.

stop "Litterbugs" fast!

INSTALL MODERN SAN-EQUIP WASTE RECEPTACLES

Here is a completely new design in waste receptacles. For use in any location, particularly where appearance is important. The San-Equip Waste Receptacle offers these outstanding features:

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- Weathertight container protects waste
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PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE WATER WORKS DIGEST

Radionuclide Identification

It has become increasingly apparent in recent years that the determination of gross radioactivity does not adequately characterize the radiological nature of water. The identification of the specific radioactive materials present is necessary for a meaningful assessment of the potential health hazard of the contamination present. Gamma scintillation spectrometry offers a possible means of simplifying this identification, however, it is not a panacea for the problems involved in radioactivity measurements. A number of the more important radionuclides, including strontium 90, strontium 89, yttrium 91, phosphorus 32, and hydrogen 3, either do not emit gamma radiation or do so only in a small percentage of the radioactive disintegrations. The principle on which gamma scintillation spectroscopy is based is the emission of a characteristic line spectrum of gamma radiation by a specific radionuclide. By the application of gamma spectroscopy the authors have shown the feasibility of this technique as a tool in the identification of radionuclides in water and other environmental samples, especially as applied to the fission products. The qualitative data obtained by this method may be used (1) to confirm tentative identifications by other methods and (2) as a guide for radiochemical separation or, alternatively, preliminary chemical separations may be used to obtain simplified spectra for quantification.

"Use of Gamma Spectrometer in the Identification of Radionuclides in Water." By G. Richard Hagee, Abraham S. Goldin, and Conrad P. Straub. *Jour. AWWA*, May, 1958.

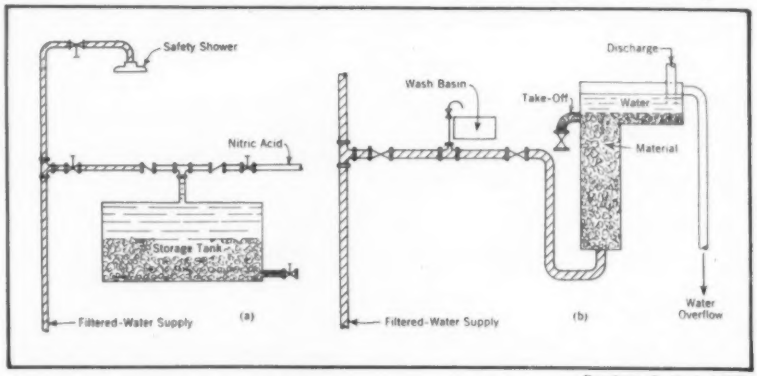
Cross Connections

To drink the mixture from a recently used water closet or to bathe in the waste liquids discharged from a urinal, the waste liquids of a radioactive laboratory, or waste of any other process is worse than disgusting. Such a condition may result, however, from the existence of a cross connection between a potable water system and a system conducting other liquids or gases which could contaminate the potable water system. It is the author's purpose to discuss some of the possible and probable ways that cross connections can occur, if adequate and frequent checks are not made during new installations and alteration work, in any plant, regardless of its size or operation. The article also discusses the necessary steps that have been taken in the Y-12 Plant of Union Carbide Nuclear Co. at Oak Ridge, Tenn., to prevent and control cross connections. The policy adopted by the plant management specifies that no connection can be made to any filtered-water line without the approval of the sanitary engineer. All engineering drawings, either made by plant personnel or outside contractors, must be approved by the sanitary engineer if they are concerned with the filtered-water system, sanitary sewer system, storm water system, or industrial waste systems. All job orders are investigated by the sanitary engineer before a permit for the installation is issued. When the work is completed the sanitary engineer reinspects the installation before it may be placed in service. Several excellent diagrams help illustrate the material in this article. It is the feeling of management of the Union Carbide Y-12 Plant that it has a good program for the prevention and control of cross connections, but officials realize that only eternal vigilance will keep the filtered water suitable and safe for human consumption.

"Prevention and Control of Cross Connections at Oak Ridge, Tenn., Nuclear Plant." By Gustave J. Angele. *Jour. AWWA*, May, 1958.

Disinfection of Swimming Pools

Disinfection of swimming pool waters has a two-fold objective: (1) To destroy pathogens and other organisms of sanitary significance that may be present in the water entering the pool; and (2) to destroy such organisms as may be introduced casually or deliberately, by persons using the pool. Various forms of chlorine are employed for disinfection of swimming pools including particularly: Liquid chlorine (dispensed as a gas and in water solution); calcium hypochlorite (in solution, granular or tablet form); and sodium hypochlorite ("laundry bleach" solution). By far, chlorine is the most widely recommended disinfectant. The combination of ammonia with chlorine is sometimes employed in certain very large or outdoor pools because of the greater persistence of chloramine residuals. Chloramines, however, are decidedly slower acting dis-



Courtesy Journal AWWA

● **TYPICAL cross connection showing two ways in which contamination can occur.**

Part of the Permutit Precipitator-filter-demineralizer plant treating 2 million gallons of water per day at West Virginia Pulp & Paper Company, Charleston, S. C.

She's only five foot two, but she "operates" these six Permutit Valveless Filters

• If these were standard manually-operated gravity filters, it would take 3 husky well-trained men (3 one-man shifts) to open and close heavy valves for shutoff, backwash and rinse. If they were table-controlled automatic filters, the initial cost would be almost *doubled.*

Fact is these filters are in the same price range as manual filters, yet they are *completely automatic.* They shut themselves off from service at just the right bed condition. They backwash and rinse at the most efficient flow rates and for a pre-set length of time. Then they put themselves back into service. The little lady doesn't have to touch them!

Permutit Valveless Filters use a simple design employing basic hydraulic principles to do the "thinking" and the work . . . replacing expensive valves, flow controllers and hydraulic or pneumatic control systems. Initial installations have been approved for treatment of drinking water as well as process water.

Our new Bulletin No. 4351 tells how you can cut both initial and operating costs with Valveless Filters. Call the nearest Permutit man or write to The Permutit Company, Dept. PW-7, 50 West 44th Street, New York 36, N. Y., or Permutit Company of Canada, Ltd., Toronto 1, Ontario.

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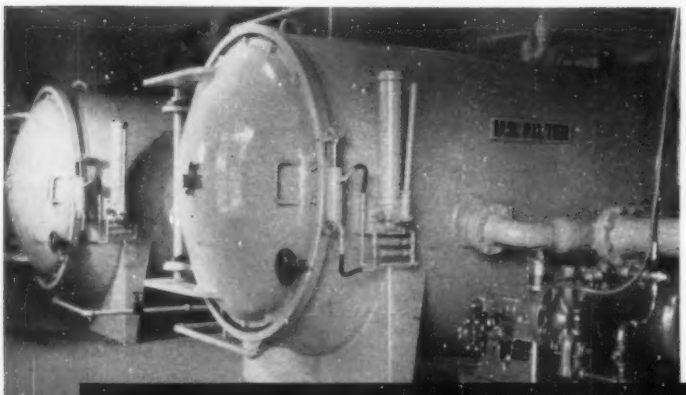

Montecito filters 1,000,000 gallons of drinking water a day–with DICALITE

The 2nd of 2 advertisements on this installation

The small space requirements of a diatomite filter system are graphically shown in the municipal water system of Montecito, a beautiful suburb of Santa Barbara, California.

Here, in the Barker Pass Filter Station, in a filter room hardly larger than the 3-car garages of many of Montecito's residents, two U.S. Filters of 1200 ft. total filter area filter 900,000 to 1,000,000 gpd. The precoat and slurry tanks are in the same room.

Despite the fact that raw water may vary in turbidity from 5 ppm to 40 ppm within 24 hours, a body feed of Dicalite Speedex in quantities proportional to the turbidity gives filtered water whose turbidity is consistently below 0.5 ppm. Semi-automatic operation of the station holds labor costs to about 1½ man-hours a day. The normal filter cycle is 72 hours, though much longer runs have been obtained in tests.

Two other great advantages of diatomite filtration are demonstrated by this installation. Low cost is one: the entire capital investment—land, structure, filter system and all piping—did not exceed $100,000. The other? Since Montecito has no industrial area, this filter station, housed in a residential-type building, is located right in the middle of a good residential section—with the full approval of all the neighbors! In fact, they regard it as a showpiece!

For more complete information on Dicalite in municipal water filtration, write for the authoritative Dicalite Bulletin-BW 13

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DICALITE DEPARTMENT, Great Lakes Carbon Corporation, 612 South Flower St., Los Angeles 17, Calif.

infectants than free available chlorine either in the form of HOCl or the OCl ion. Several pools, particularly in Illinois, employ bromine as a swimming pool disinfectant. Ozone is a satisfactory disinfectant but there is no evidence that it has a residual sterilizing effect—an especially important feature. While ionized silver is used extensively abroad, only a few domestic applications have been reported and it is not included as a recommended disinfectant by the Joint Committee on Bathing Places. The use of ultra violet rays is not recommended as a disinfectant by itself because no residual effect is achieved. The considerable variation in disinfection practice in this country demonstrates a need for uniform recommendations as to type and amount of chlorine residuals to be maintained, to include consideration of the relationship of pH both to efficacy of disinfection and physiological effects.

"Disinfection of Public Swimming Pools." By Edmund J. Laubusch, S.M. PUBLIC WORKS, June, 1958.

Temperature and Drawdown Control

Lincoln, Neb., over the past 24-year period has developed a 68-mgd source of water supply consisting of 33 wells that have been properly spaced along the Platte River in a gravel aquifer to control water temperature and provide optimum discharge and minimum drawdown. The well field was developed in four progressive steps beginning in 1932 with nine wells that produced about 18 mgd. Further developments were made in 1949 that raised the capacity to 27 mgd, again in 1954 that increased the yield to 48 mgd. Then in 1956 ground water studies were conducted in a nearby Natural Guard camp area to determine whether this site would provide the additional 20 mgd water supply needed to keep the city abreast of accelerating water demands. Also of importance in this study was the possibility of making further economic use of 25 miles of existing 36 and 48-inch dual transmission lines, as well as the iron and manganese removal facilities located at the well field. The city's 1956 development plans considered three well field areas which were evaluated through existing and newly drilled test holes. After 30 days of continuous pumping of the test wells in this area it was determined that approximately 80 percent of the well discharge from this field is derived directly from river water in-

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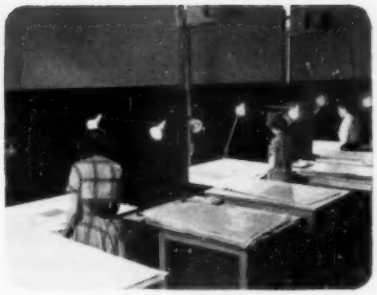

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filtration. Temperature characteristics of the water are such that the well water temperature averages six months out of phase with the river water temperature. The approximate relations of the distance from the river and the amount of infiltration and the temperature variance for a given aquifer are stated in the article. The mutual interference of the existing wells was measured in the field. The new wells averaged about 70 feet in depth, all of which was in good material ranging from coarse sand to coarse gravel and boulders. These wells will produce 2,000 to 2,200 gpm with very little more drawdown than some of the previous wells showed initially at 1,400 gpm.

"Spacing Wells to Control Water Temperature and Drawdown." By William P. Richards and Bruce B. Watts. *Water Works Engineering*, May, 1958.

Radioactivity at Chicago

The South District Filtration Plant has carried out a program of radioactivity monitoring for the detection of contamination of Lake Michigan water for more than 6 years. The monitoring program in Chicago is divided into three phases: Continuous monitoring; regular sampling and counting of raw and treated water; and sampling and counting of precipitation as rainfall or snow. Although the continuous system is not sensitive to the present low activity levels, it serves for the detection of possible sudden and pronounced changes in the activity of the raw-water supply. The daily samples of raw and treated water are evaporated and counted, using a proportional counter to detect changes in radioactivity at levels which are currently encountered. Such measurements have been made over a period of years and are of such sensitivity that increases in the gross activity of the lake following periods of nuclear weapons testing have been detected. It was possible during July, 1957, to measure the removal efficiency of the plant with some accuracy. It was found that an average cleanup of 40% was obtained, and it appeared that the removal of relatively short-lived activities was slightly higher. Attempts were made to estimate the activity associated with strontium 90 and iodine 131. No statistically valid results were obtained for the former, but the presence of iodine 131 was indicated.

"Studies of Radioactivity in the Chicago Water Supply." By James C. Vaugn, Robert W. Schmidt, Alfred Tenny, and Arthur Shor. *Jour. AWWA*, May, 1958.

Good Meter Maintenance

Billings, Mont., has been the scene of one of the most dramatic building booms and water supply challenges in the nation. This tremendous growth, due to one of the most productive oil field discoveries in North America, has resulted in a doubling of the number of water services in the past 10 years. Billings' 100% metering plan, backed up by a new streamlined meter maintenance and repair program has made it possible for the city to bill for 87.3% of the water it pumps out of the Yellowstone River. The present water works expansion cycle began right after World War II. The first step was the construction of a 24-inch transmission line into the eastern end of the city, to augment the existing 14 and 16-inch lines. Before this line could be completed, summer rationing was common. In addition a 30-inch line from the plant to the west end of the city was installed. To maintain pressures in the west end, four storage units were constructed: A

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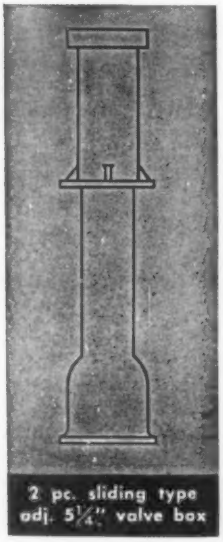
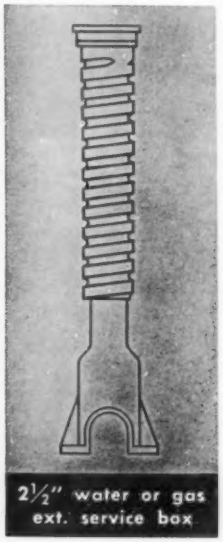


2 pc. sliding type adj. 5¼" valve box



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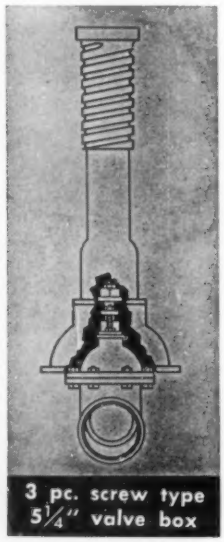

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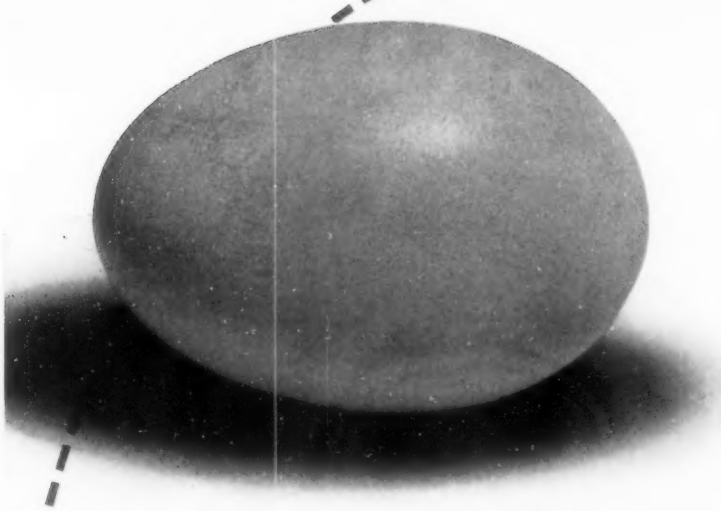

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For further information, write Department 3A, Precision Chemical Pump Corporation, 1396 Main Street, Waltham 54, Mass.

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3,000,000-gallon reservoir; a 3,225,-000-gallon standpipe; a 500,000-gallon standpipe and a 250,000-gallon concrete reservoir. Along with the expansion of plant and transmission lines came other improvements. For example, the city is just completing one of the most modern municipal service building. This new building houses one of the best meter repair shops in the northwest. Billings removes and tests every household-size meter every 7½ years. All meters brought into the shop go through the same procedures. Briefly, this consists of testing the meter for accuracy; then it is disassembled and thoroughly washed with water; then dipped in Pro-Solv solution and heated to just below the boiling point to remove grease, paint, and other surface grime.. The next step is dipping the meter shell and parts in Removsall scale solvent which is effective in removing scale and rust. The next step is cleaning in 50% nitric acid, then into lye water and then into a brass dip. Before being reassembled, meters are inspected and worn parts are replaced by factory-new parts. The repaired meters are then tested at ¼ gpm, 1 gpm, and full flow to attain accuracies as close to new meter accuracy as possible. Accuracies of 99 to 100% on full flow are being achieved. Special attention is paid to meter maintenance in Billings, because a meter is the department's "cash register." Only the water sold through meters can produce revenue, and adequate revenue is the only route to healthy finances.

"Good Meter Maintenance Helps City Bill for 87.3% of Water." By Edward R. Waldo. *Water Works Engineering*, May, 1958.

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A simple, compact meter housing, complete with service valve, for warm climate installations. The modern and better way to install water meters. Gives better protection, keeps meter cleaner. An investment in easier meter reading, longer meter life and greater revenue.
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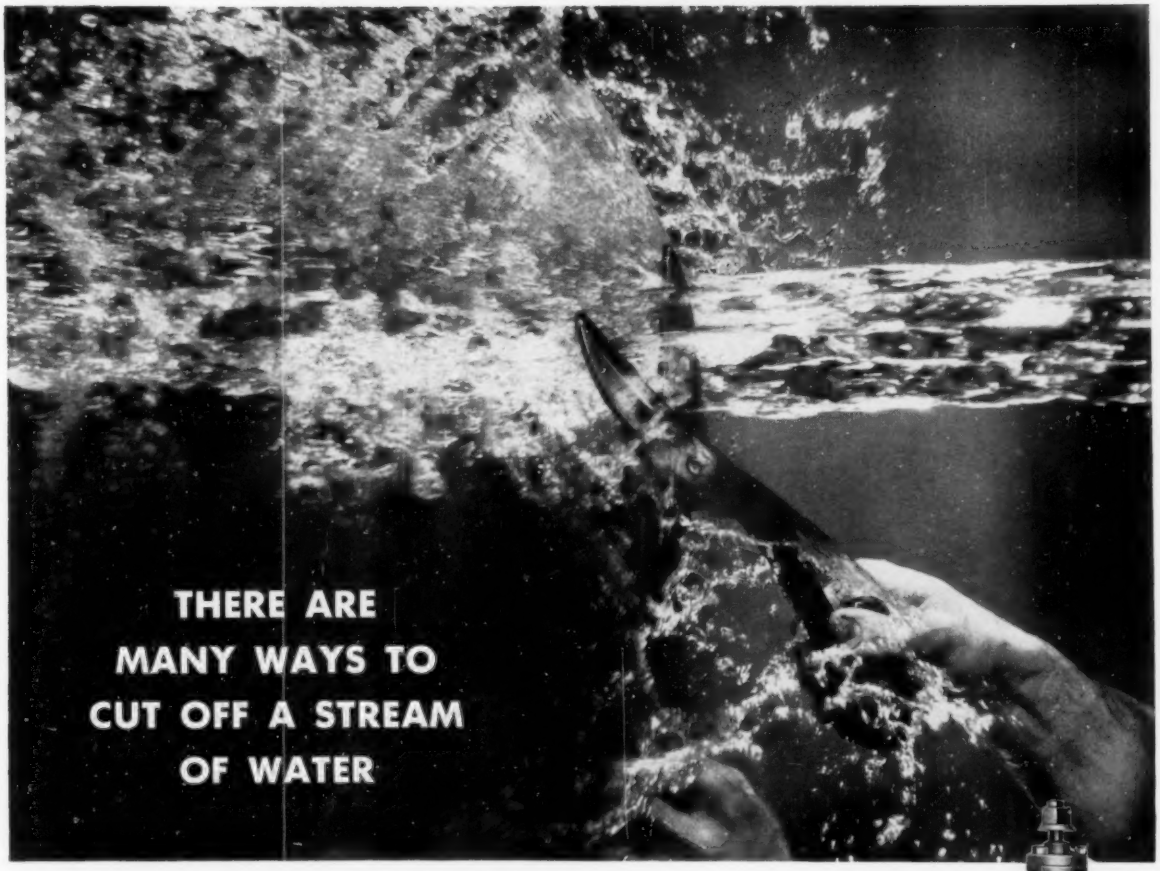
Colored Water—Red, Black or Blue

This paper reviews and discusses some experiences and the difficulties associated with these types of waters. Red water gets its nickname because it has suspended in it finely divided particles of iron rust in the oxidized, ferric state (Fe^{+++}). Such water usually has a total iron content of 2.0 ppm or over (some present as ferrous iron). Red water may be present in the distribution system through either of two reasons: (1) Because the iron-bearing water was pumped into the system without removing the iron; or (2) because an aggressive corrosive water was introduced into the system containing unlined cast-iron or steel pipe. Red water may also follow mechanical cleaning of iron or steel mains. A number of conclusions concerning red water difficulties and their solutions are enumerated. The black water problems or complaints result from the presence of small, floc-like particles, light somewhat greasy looking, that cause dark-brown or black staining of clothing washed in the water and are usually due to the presence of manganese. This chemical may enter water supplies through acid-mine wastes, through solution of manganese-bearing minerals (in wells), and through similar solution and organic decomposition in the bottom of reservoirs. Present in the manganous form, it is usually removed by oxidation to the manganic state, but this reaction proceeds very slowly at low pH values, the rate increasing as the pH is raised. Several examples of difficulties with manganese are cited in this article. The term "blue" water refers to the blue stains caused by copper-bearing waters rather than to the color of the water itself. Tentatively, investigations show that raising the pH to 7.0 or higher will prevent the staining of bathroom fixtures.

"Colored Water—Red, Black or Blue." By John J. Hamilton and Martin E. Flentje. *Water and Sewage Works*, May, 1958.



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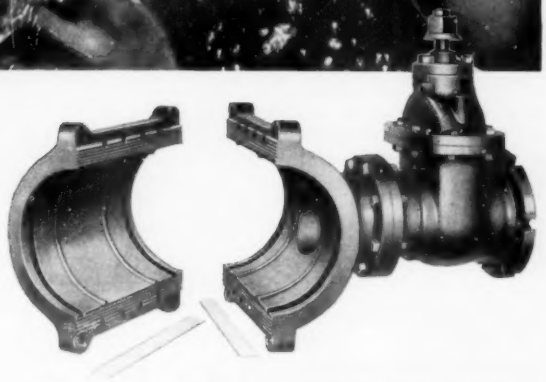

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PUBLIC WORKS DIGESTS

Prepared by

FRANK FORCE

Associate Editor

THE HIGHWAY AND AIRPORT DIGEST

Television For Traffic Control

Television cameras, installed at the Framewell Gate and Elvet Bridges in England, give the police constable in his control box in the Market Square a picture of the volume of traffic waiting at, or approaching, either bridge. The miniature television cameras are connected by closed circuits to screens in the control box. They transmit pictures of hundred-yard stretches of the roads showing the actual traffic at the bridges and enable the constable operating the lights to reduce delays. The equipment consists of 2 camera heads, each with a camera control unit and two 9-in. Video monitors. Each camera head contains a Staticon camera pick-up tube on a special carriage driven by a reversible AC motor, thus enabling it to be focused remotely. The camera heads are mounted in waterproof housings. The plate glass rubber sealed windows are fitted with self-parking windscreen wipers and internal heaters are incorporated to provide de-misting facilities.

"Television For Traffic Control!" *Roads and Road Construction*, April, 1958.

Earth Retaining Structures

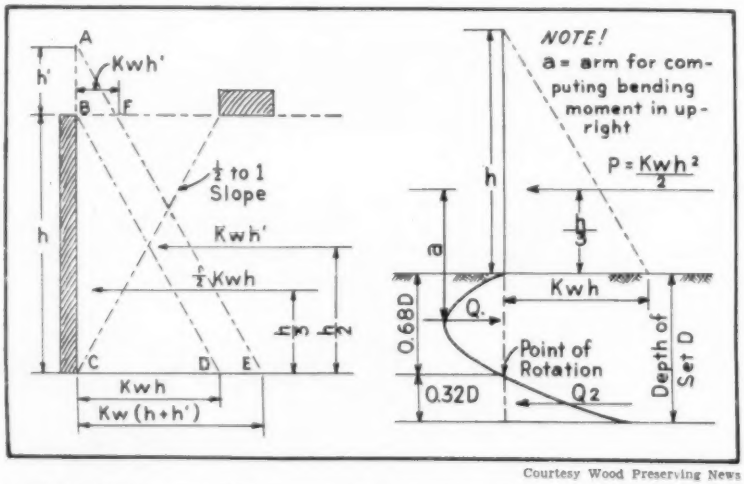
Treated timber bulkheads and cribs are used extensively for retaining earth embankments. The most common type is the sheet-pile wall held in line by guide piles and heavy timber walls. For heights of 7 ft. and less the support posts, if set to recommended depths, provide ample resistance to overturning without tiebacks, or other lateral bracing. Higher walls are tied back to deadmen or anchor piles by rods or cables. Horizontal thrust is usually calculated by the formula $P = \frac{Kwh^2}{2}$. For surcharge loads, an allowance should be made for unit load equivalent to that obtained by a reasonable distribution of the weights of these structures. Low walls of timber depending for their stability on the guide piles or posts acting as cantilever beams fixed in the underlying soil are often used for retaining low fills. The formula $D = \frac{2.37P + \sqrt{(2.37P)^2 + 10.56PHSB}}{2SB}$ is used to find the depth of set needed to prevent a lateral force acting at a given distance above the ground from causing objectionable deflection. The bending moment on an intermediate post can be calculated by $\frac{SKwh^2}{2}\left(\frac{h}{3} + \frac{D}{3}\right)$. For determining thickness of plank required at the different levels the bending moment should be taken as $\frac{wL^2}{8}$, since many of the planks will be continuous over two spans only. Equal span lengths are usually maintained and the formula $t = 3S\sqrt{\frac{wh}{fb}}$ is used for computing plank thickness required at the different levels.

"Notes on Earth Retaining Structures." By W. D. Keeney, District Engineer, American Wood Preservers Institute. *Wood Preserving News*, April, 1958.

Plantings for Highway Roadsides

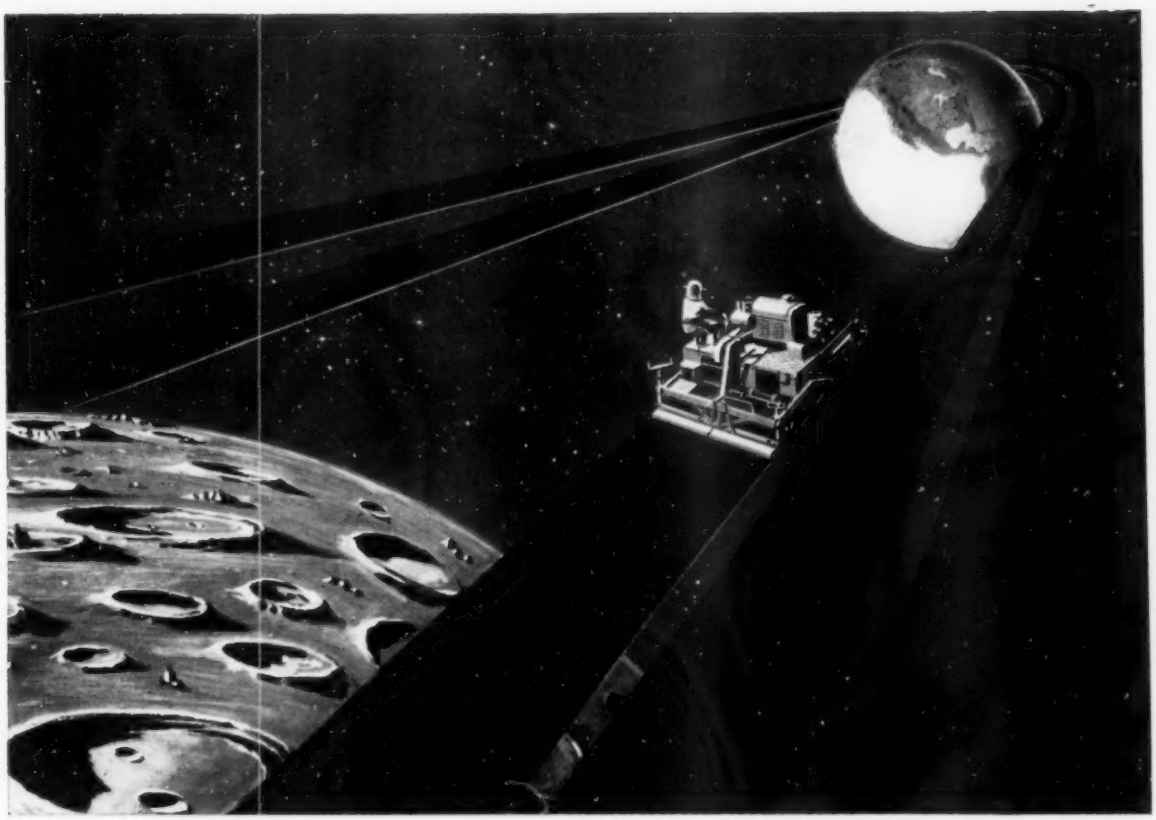
Landscape Architects realize that the movement of motor vehicles rapidly, efficiently and safely depends not only upon what happens in the traveled way, but also what happens in the roadside areas. The Landscape Architect should be consulted on the designing of the highway; he should be along on the field check; and he should be present at the meeting of the contractor and the highway department at the time the plans are reviewed prior to starting construction. Slopes should be kept as flat as practical and they should be rounded and warped to provide a smooth transition into the existing topography. The conservation of existing plant materials within the roadside areas should reduce the need for new material and tend to keep down costs. The selection of grass seed, fertilizers and mulches which are best suited to the area, soil, exposure and general climatic conditions is of great importance; but of equal worth is the preparation of the seed bed, keeping the mulch in place, and the other work operations vital to good results. Sod will need to be used in ditches or other areas that may have a tendency to erode before grass can be established by seeding. Functional planting of trees and shrubs is designed for specific purposes. Good mechanical roadside equipment will help to keep the cost at a minimum and still give good results.

"Plantings for Highway Road-



Courtesy Wood Preserving News

● **ELEMENTS in computing pressures and moments for design of retaining walls.**



The 5th (s)trip to the moon has been started

By conservative estimates, the thousands of Barber-Greene Finishers throughout the world have started paving their second million miles. That is the equivalent of more than four trips to the moon. The current design of the Model 879-B is based on that experience.

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CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

sides." By Wilbur J. Garmhausen, Chief Landscape Architect, Ohio Highway Dept. PUBLIC WORKS, June, 1958.

Salt-Soil Stabilization An Aid to Longer Lasting Streets

There are 6 basic benefits of a salt stabilized road. These are: 1) The safety factor, loose gravel or stone is dangerous; 2) low construction and maintenance cost; 3) smooth riding surface; 4) reduced loss of road material; 5) reduced frost heaving through lowering freezing point; and 6) creates good will in the driving public. In Mason County, Michigan, it is the practice to add salt to the gravel at the rate of 12 lbs. pcy. This provides 2 tons per in. of depth per mile of 20-ft. roadway. Salt should be applied with a mechanical spreader for better distribution and then be blade-mixed; or by a pass or two with a mechanical mixer. Water should be available in quantity to permit wetting of the base and the stabilizing material. In most cases 4 ins. of processed gravel should be the minimum depth on light-traffic roads. The road should be built-up in layers from 1 to 1½ ins. The proper crown should be built in during this operation and a 5-in. crown is desirable for a 20-ft. road. Traffic or a roller of the pneumatic type is used for compaction. When the surface becomes rough, the only maintenance required is to smooth the road lightly with a blade after wetting by a water truck or rain.

"Salt-Soil Stabilization An Aid to Longer Lasting Streets." By Robert E. Lunde, Engineer Manager, Mason County Road Commission, Scottville, Mich. *The American City*, May, 1958.

High-Speed Electronic Digital Computers

The practical business of realizing the almost unlimited potential of electronic computers, one of the great challenges and great opportunities facing today's civil engineer, is the general theme of eleven articles: A Revolution in Design Practice; Choosing Your Digital Computer; Computers Shown at ASCE Chicago Convention; Computers in the Profession; Machines in Home Office; Use of Electronic Digital Computers in Highway Engineering; Solving Spiral Bridge Geometrics By Computer; Bridge Piers Designed By Computers; Designing Steel Bridges By Computer; Some Applications of a Digital Computer in Structural Research; and Columbia Basin Streamflow Routing By Computer. These articles were written by prominent men in the civil and public works engineering field.

Civil Engineering, May, 1958.

Concrete Bridges— Design and Construction

In England, progress on bridge construction since the war has been lamentably slow in comparison with most other countries due to the financial restrictions. The use of prestressed concrete as the medium of construction for bridge decks has been shown to provide a very economical solution in the range of span from 30 ft. to 120 ft., with its low initial cost and expected long life with little maintenance expenditure. The solid type of deck slab in prestressed concrete is usually the most satisfactory for spans up to 40 or 45 ft. The composite form of construction has been shown by tests to provide good load distribution characteristics under heavy loading, when reinforced transversely with mild-steel bars through holes located in the web, and with a mesh of reinforcement in the top of the in situ slab. Such bridges with their small construction depth have been utilized ex-

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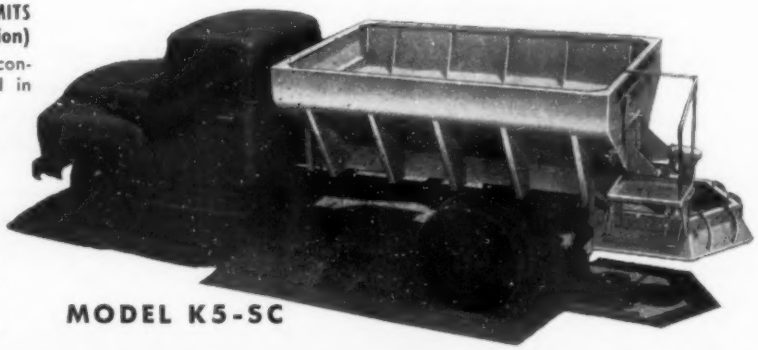

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tensively to replace weak and inadequate bridge decks, and often enable the engineer to reduce a hump or increase vertical visibility, or to provide increased headroom in special cases, without alteration to road level on the approaches. The use of long factory-made units is likely to involve problems in delivery to site and in erection unless a heavy crane is available. In such cases the possibility of precasting the units in smaller sections, erecting these on a prepared scaffolding and stressing together, will need to be considered against the casting of the concrete in situ, and the difficulties in controlling concrete quality in some of the isolated localities.

"Concrete Bridges—Problems in Design and Construction." By A. W. Hill. *Contractors Record and Municipal Engineering,* April 23, 1958.

Field Inspection of Concrete

The Division of Materials of the North Carolina State Highway Commission assign inspectors to all highway concrete projects. Six Concrete Technicians travel from job to job checking and approving all ready-mixed concrete plants and all transit mix trucks before any concrete is batched out. The State maintains constant inspection at all commercial sources of supply of fine and coarse aggregates. The first item of inspection before beginning batching is the determination of the water content of the fine aggregate by the Sand Moisture Tube and the Speedy Moisture Tester. Scales must be checked and calibrated 24 hours before production starts. The Kelly Ball is used to determine the slump of the concrete but cannot be used when the slump is greater than 5 ins. The minimum number of revolutions on the truck mixer is 70 or at whatever other number the truck best mixes the concrete. A large bucket will hold enough concrete for 3 cylinders for compression tests or one 6 by 30-in. beam for flexural testing. The sample should be taken some time between the first and last quarter of the batch. A Techkote meter is used to check the entrained air in the mix. The air test should show a value between 4.0 and 5.5 percent. The specimens for strength tests are placed in one of 2 curing conditions: 1) as nearly 73.4°F. and continuously wet as possible in the field, for the purpose of determining whether the concrete mix design is adequate to provide the strength specified; or 2) in a box of damp-sand or sawdust which is kept at the temperature prevailing on the job so that the specimens will tell whether the strength that has been developed by job conditions is that which is necessary for placing the structure into service. A Vibra-Tack is used to check the frequency and amplitude of the vibrating equipment.

"Field Inspection of Concrete." By C. E. Proudley, Chief Materials Engineer, North Carolina State Highway Commission. PUBLIC WORKS, June, 1958.

How Good Are the Diesel-Powered Pile Hammers?

There are 3 principal diesel hammers on the market today. The Delmag, the McKiernan-Terry and the Link-Belt Speeder. Basically the hammer itself consists of little more than a cylinder-encased ram, an anvil block, a simple lubrication system and, except for the Link-Belt, an even simpler fuel injection system. In spite of its simplicity and easy adaptability to standard cranes, the diesel hammer cannot be regarded as a panacea for all pile-driving problems. Proper evaluation of its potential role warrants an analysis of its features. Here are some of the advantages of using

The modern lines of this Tassco Tomcat street name sign represent a clean, wide-awake community. Day or night, Tassco's exclusive tear-drop shape puts the street name at the correct eye angle for clearest readability. What's more, the Tomcat's all-aluminum construction is durable, tamper-proof, easy to install, and never needs painting.

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this type of hammer: 1) The diesel hammer is independent of outside power supplies; 2) it is economical; 3) maintenance and servicing are slight and fast; 4) it is effective in hand driving; 5) it is light; 6) it has safety features; 7) universal drive caps are available for some makes; and 8) cold weather operation is simple. The disadvantages are as follows: 1) Accurate determination of the energy output of diesel hammers is difficult; 2) extremely soft driving can be a problem; 3) the hammer is long; and 4) it is not fast.

"How Good Are the Diesel-Powered Pile Hammers?" By Edward M. Young, Jr. *Engineering News-Record*, May 15, 1958.

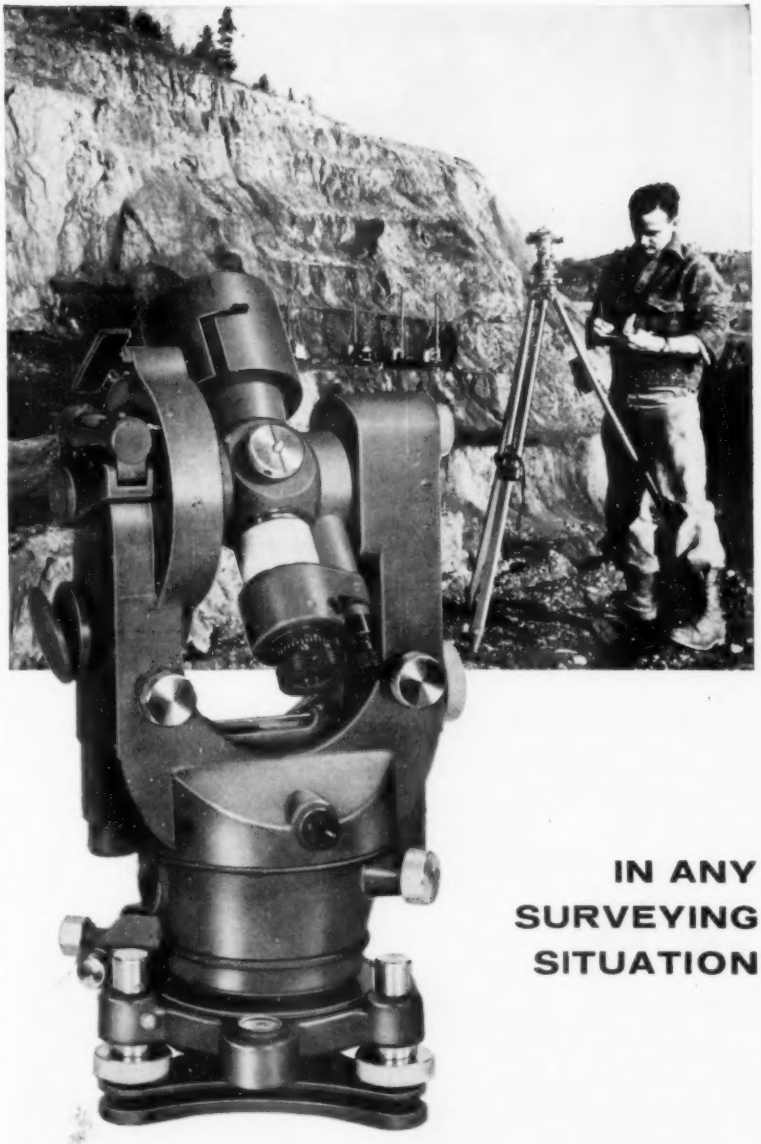
Estimating the Compressive Strength of Hardened Concrete

A simple and portable instrument for use in estimating the compressive strength of hardened concrete has been developed. The device, known as the Swiss Hammer, is designed for field use and is not intended as a substitute for control testing. It is being used in the field to gage increases in concrete strength with age and in locating low-strength areas when laboratory tests of control concrete cylinders or other conditions indicate that such areas might exist. It is useful in surveys of old structures. The results of the tests given in this article show that factors such as surface smoothness, surface moisture condition, and type of coarse aggregate affect the strength values obtained by the use of the device.

"Use of the Swiss Hammer for Estimating the Compressive Strength of Hardened Concrete." By William E. Grieb, Highway Physical Research Engineer. *Public Roads*, June, 1958.

Rural County in Minnesota Relies on Good Roads

Pipestone County, Minn., has 450 miles of highways with 10 percent of the roads having a bituminous surface and the remainder having a gravel surface. As rapidly as funds will permit the reconstruction of old roads are planned. There are three sources of revenue: federal aid, state aid and the local tax levy. Surveys and plans are made by the county engineering staff. The roads are designed with a 100-ft. right-of-way so that flat slopes can be constructed. Most of the rights-of-ways are 66 ft. and an additional 34 ft. are needed. Property owners are paid a nominal price for their property. A set price is used for re-



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moving and resetting fences. The gravel roads are being constructed with bituminous surfaces and drainage structures are being provided. At least one new bridge per year is being built.

"Rural County in Minnesota Relies on Good Roads." By Ray D. Setterlund, Pipestone County Engineer, Pipestone, Minn. *Better Roads*, May, 1958.

Other Articles

"**Driveways and Approaches** for Modern Automobiles." The design and construction of new driveways and approaches by means of up-to-date regulations, and proper office and field procedures are being conducted by El Cerrito, Calif. By Marvin Anaya, Director of Public Works and City Engineer, El Cerrito, Calif. Pubic Works, June, 1958.

"**Sidewalks, Curbs, Gutters** Designed Highway Style." By Philip E. Johnson, City Engineer & Street Supt., Redlands, Calif. The American City, May, 1958.

"Unique Washer Cuts **Tunnel Maintenance Costs.**" Equipment consists of one or more revolving, cylindrical brushes mounted on the front of a lift truck. Both the detergent mix and the rinse are applied automatically through spray nozzles which are connected by flexible hose to storage tanks installed on a trailer hitched to the rear of the lift truck. By Phil Hirsch, Public Works, June, 1958.

"What's New in Machinery and Construction Methods for **Bituminous Paving.**" By H. A. Radzikowski, Chief, Division of Development, Office of Operations, Bureau of Public Roads. Public Works, June, 1958.

"Fast-Moving Spreader Lays **Cement-Treated Rock Base.**" Bulk cement is spread on windrow of crushed aggregate, permitting traveling mixer to produce base course. By Ralph Monson. Contractors and Engineers, May, 1958.

"**Heavy Post-Tensioned Concrete Girders** For Second Narrows Bridge." New crossing at Vancouver, B. C., includes 108 girders, each 120 ft. long and weighing 74 tons. By Carl Stanwick, Chief Engineer, Kiewit-Raymond Construction Co., Vancouver, British Columbia. Roads and Streets, May, 1958.

"**Contractor and Traffic Took Turns on Freeway Job** in the High Sierras." Unprecedented traffic interruption required in four-laning California US40 through Truckee Canyon. Special job sequence and other cost-increasing provisions included in $5 million contract. Roads and Streets, May, 1958.

"Developing an **Electronic Computer Center** in Kansas Dept." By the time the computer and other equipment were installed at the center, men were trained and programs prepared so that production could begin almost immediately. By James N. Vaughn, Engineer-in-Charge, Kansas Computer Center. Better Roads, May, 1958.

Essex County, N. J., is Using Tynex in Sweeper Brooms

Essex County, N. J., has filled two street sweeper brooms with Tynex nylon filaments. Tynex is natural (off-white) in color and has a diameter of 0.075 ins.; it is cut to lengths of 24 inches (for use in strip brushes) or 26 inches (for use in cable-wrapped brooms). It is unaffected by water, gasoline, grease or other matter commonly encountered in street cleaning and it is not necessary to pre-treat with water before using.

Robert Wiggins, Product Technologist of DuPont, showed how easy it is to fill a broom with Tynex at a demonstration recently at the Essex County Highway Garage in Orange, N. J. Two men are required to fill a broom and about 50 strands of filament are used in placing each bundle on the broom drum.

Curtis Colwell is Essex County Engineer and Dan Murray is his Superintendent of Maintenance. Additional information on Tynex can be had from Polychemicals Dept., E. I. duPont deNemours & Co., Wilmington 98, Del.

• • •

Work on Parts of the Maine Interstate System

Fay, Spofford & Thorndike, Inc., Consulting Engineers, are preparing plans for 11 miles of 4-lane roadway and 12 bridges, plus interchanges and grade separations for Maine on the Portland-Yarmouth Interstate System. The estimated construction cost of this project is $11,000,000.

The 11 miles section will have an 8-inch concrete pavement. There will be 5 interchanges constructed and there will be more than one double structure bridge or local overpass for every mile of the new highway. Eight of these structures must be supported on steel piles, up to 90 ft. in length at some crossings due to the character of the soil, which near the surface is compact and hard, but is less stable at greater depths. Piers for the other four structures rest on rock foundations and the abutments are on stub piles.

All lighting will be at the 5 interchanges. Mercury vapor lamps mounted on aluminum mast-arms and standards will be installed approximately 30 ft. above the street surface to give the required footcandle level. Lamps are either 21,000 or 11,000 lumens. Individual transformers are located in the base of each standard.

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PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D.
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE SEWERAGE AND REFUSE DIGEST

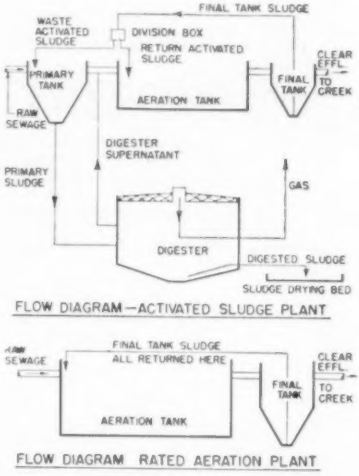
Total Oxidation Treatment

The treatment process providing total oxidation of organic wastes, initially applied to the treatment of dairy wastes, has developed in recent years into an important method of waste treatment. At present there are approximately 175 plants either installed or in the process of installation. This total oxidation process consists primarily of comminution of the sewage, long-term aeration, final settling of the sludge, and return of the settled sludge to the aeration tank. The accompanying illustration shows flow diagrams for an activated sludge plant and a plant adapted to use the Ratedaeration design. This shows the simplified layout of the complete oxidation type of plant. Primary settling and sludge digestion are eliminated, while the aeration system in the total oxidation unit is enlarged to provide the required aeration period. This process is particularly suited to treat the wastes from schools, motels, factories, dairies, small subdivisions, and a variety of industries with installations ranging from a minimum of 2,000 gpd to approximately 200,000 gpd. The design of these plants has been conservative so that accurate control of operational variables is not needed. The aeration period usually provided is 24 hr, with a BOD load not to exceed 30 lb/1,000 cu.ft. of aeration capacity. In operation, the plants employing Ratedaeration accomplished BOD reductions of 75 to 90 percent with effluent BOD consistently below 20 ppm when treating normal domestic sewage.

"Total Oxidation Treatment of Organic Wastes." By John A. Tapleshay. *Sewage and Industrial Wastes*, May, 1958.

Waste Stabilization Ponds

Stabilization ponds are operating in all sections of South Dakota. Some application of this method as a complete or secondary treatment device for industrial wastes has been made in this State. A small meat packing plant has used a stabilization pond successfully for over two years. Waste stabilization ponds applied to treatment of milk wastes appear to be a solution to a particularly difficult treatment problem. The mechanism of waste treatment by this method depends largely on the interactions of bacteria and algae. Bacteria convert the decomposable organic matter to more stable products and in so doing liberate nutrient elements necessary for algae growth. The algae utilize these abundant nutrient materials and through photosynthesis produce the surplus oxygen required for aerobic bacterial action. Studies in North and South Dakota show that the average minimum reduction in BOD concentration was 70% which occurred during the months of ice cover. Maximum reductions in BOD concentrations approached 99%. Reductions in coliform density were found to be 99% or over more than 50% of the time and, with few exceptions, were 95% or more at all times. Experience has indicated that providing one surface acre per 100 population equivalent (15 to 20 pounds BOD) will be sufficient (1) to provide an adequate degree of waste treatment; and (2) to provide such treatment without creating nuisance conditions. Construction costs on 19 of the installations average $15.92 per capita. Average land costs represent an expenditure of $4.67 per capita. The average cost of providing sewage stabilization ponds in the municipalities represented in the listing was $20.59 per capita.



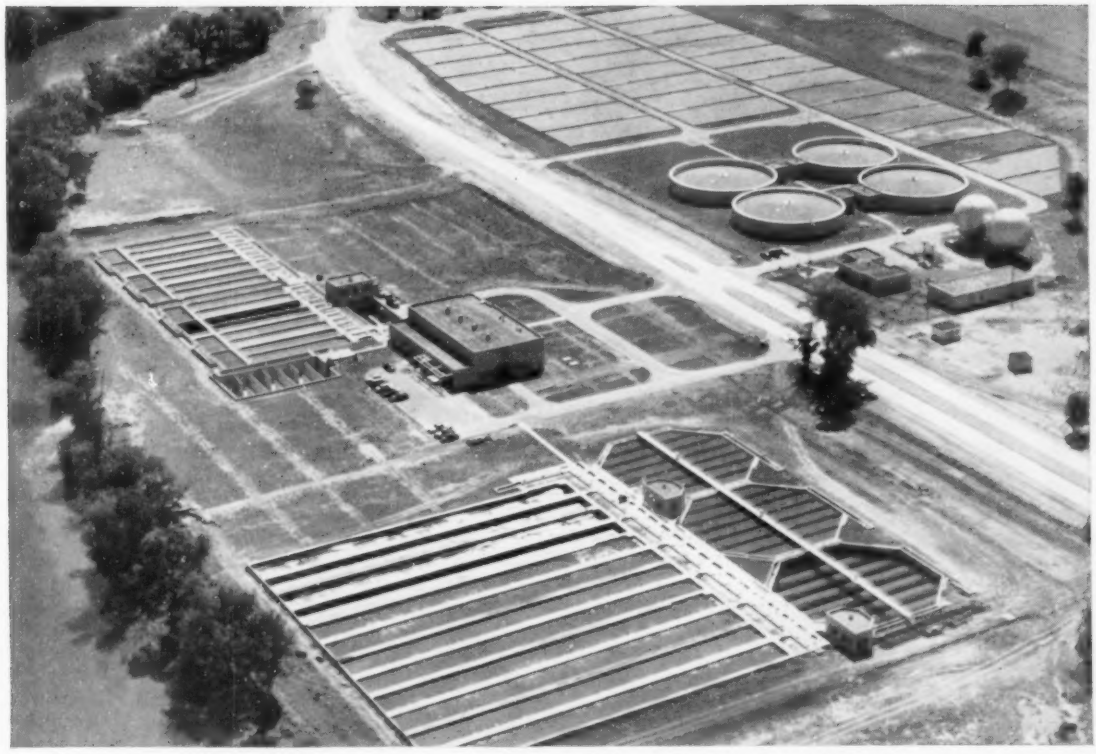
Courtesy Sewage and Industrial Wastes

● **FLOW diagrams show units in activated sludge and Ratedaeration plants.**

"Waste Stabilization Ponds in South Dakota." By Don C. Kalda. PUBLIC WORKS, June, 1958.

Seattle's Sewage Plant

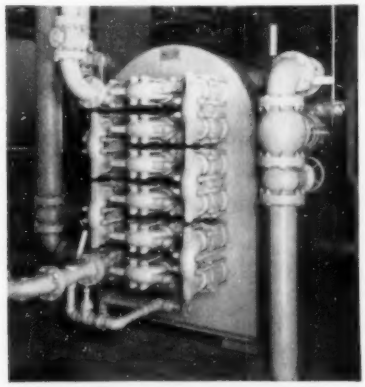
A $164 million sewage works construction program has been proposed for the Seattle metropolitan area. Of this amount, $83 million would be spent by 1970. The report also urges storm drain and combined sewer separation programs estimated at $214 million, and it suggests establishment of a central regional agency to administer all of the proposed construction. The study included a 575-square mile area containing 19 incorporated municipalities with a present population of 864,000 persons. The report estimates 1980 population at 1,260,000 and 2030 population at 2,240,000. The study area includes 15 operating sewerage systems and eight semi-public and private systems, all of them primary plants. Over 50 mgd of sewage flow is discharged without treatment and only 70% of the population is served by sewers. Detailed studies were made to develop a comprehensive sewerage plan for the area. Two major systems and several minor systems were recommended. One plant will use the activated sludge process; this would have an initial capacity of 24 mgd and ultimate capacity of 144 mgd. It would discharge effluent into the Duwamish River with sludge lagooned. The second major system consists of a primary plant to handle 118 mgd average dry weather flow. The plant would include grit removal, bar screens, preaeration, sedimentation, sludge



South Bend Sewage Treatment Plant located on the St. Joseph River. The four PFT Floating Covers can be seen in the background. Consoer, Townsend and Associates, Chicago, Consulting Engineers.

South Bend restores beauty and recreational facilities to the St. Joseph River

This new South Bend Sewage Treatment Plant has solved a long-time health hazard for South Bend and all the communities to the north on the St. Joseph River. The river is now being restored to its natural cleanliness and beauty.



Special PFT-Drum Type Heat Exchanger Units

PFT equipment plays a big part in this sewage treatment and reclamation project. Each of the four 110′ digesters is equipped with PFT Floating Covers. Heat for the digesters is supplied by the two No. 750 Heaters and Heat Exchangers and two PFT No. 429-E Special Drum Type Heat Exchanger Units.

These Special Drum Type Heat Exchanger Units (shown at the left) are so arranged that the Jacket Water heat is transferred to the digesters and excess heat may also be dissipated to effluent circulated through the drum shell. The South Bend Plant also makes use of the PFT-Kraus Process for Activated Sludge Control.

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digestion and chlorination. Effluent would be discharged to Puget Sound through a 3,700-ft. outfall terminating at a 150-ft. water depth. Digested sludge would be discharged through a 4,000-ft. outfall into a 400-ft. depth of water. Financing of the sewerage construction is possible through revenue bonds backed up by sewer service charges.

"Seattle Gets $164 Million Sewage Plant." *Engineering News-Record*, May 29, 1958.

Blackstone Valley Sewage System

In 10 years of operation, Rhode Island's Blackstone Valley Sewer District Commission has effectively controlled the sewage and industrial wastes pollution in the compact district which covers an area of about 75 square miles with a population of approximately 170,000. The commission was directed by law to combat water pollution within, or emanating from, the district which was defined as the cities of Pawtucket and Central Falls and the towns of East Providence, Lincoln and Cumberland. In June, 1950, sewage was channeled into the district's system for the first time and was conveyed to a temporary chlorination structure at the treatment plant site. The Bucklin Point sewage treatment plant is designed to provide primary treatment for 20.3 mgd. It was completed and placed in operation in 1952 at a cost of $3.12 million. The plant provides sewage screening, grit removal, pre-aeration, primary settling, chlorination, sludge digestion and vacuum filtration. In May, 1954, the present classified user rate structure was established to provide for self-liquidation of the project which was financed by the sale of a total of $15 million of general obligation bonds of the State of Rhode Island.

"Ten-Year Operation at Blackstone Valley Proves Soundness of Financing Plan." *Wastes Engineering*, May, 1958.

San Juan's New Treatment Plant

The responsibility for sewage collection and treatment throughout Puerto Rico rests with the Puerto Rico Aqueduct and Sewer Authority which also owns and operates all the public water supplies in the 75 municipalities on the island. The Authority's first concern, after its creation in 1945, was the rehabilitation of the island's public water systems but the long-standing sewerage problems of the San Juan Metropolitan area soon engaged its attention. Early in 1946 a comprehensive engineering study of the sewerage needs was undertaken to formulate a long-range master plan for the area according to the needs which could be met whenever it would be possible to finance the necessary construction. The master plan calls for a comprehensive system of interceptors, trunk sewers, and lift stations which will eventually serve an area of about 42 square miles serving nearly 600,000 persons by the year 1975. Construction of main trunk sewers was initiated in 1953 and of the sewage treatment plant in 1955. The treatment plant was virtually completed and placed in partial operation in December, 1957, with an initial flow of only about 4 mgd. However, with completion in 1957 of the principal lift station the volume of sewage treated is expected to jump to over 15 mgd. Plant facilities consist chiefly of a screen chamber, raw sewage pump house, grit-removal tanks, settling tanks, effluent control structure, sludge digesters and field beds for sludge drying, and sewer outfall. The entire plant, exclusive of administrative costs, land, engineer-

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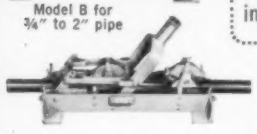

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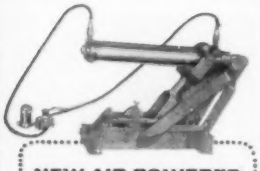

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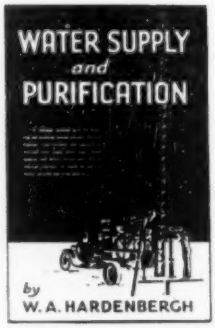

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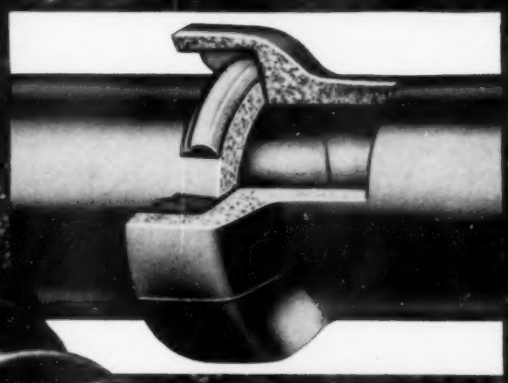

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Gladding, McBean & Company, Los Angeles 54, Cal. *(Sold under trade name, "SPEED-SEAL")*
The Logan Clay Products Company, Logan, Ohio
Oconee Clay Products Company, Milledgeville, Ga.
Pacific Clay Products, Los Angeles 54, Calif.
Pine Hall Brick & Pipe Company, Winston-Salem, N.C.
Pomona Terra-Cotta Company, Greensboro, N.C.
The Robinson Clay Product Company, Akron 9, Ohio
The Stillwater Clay Products Company, Cleveland 16, Ohio

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ing and legal fees, and landscaping still to be done, came to approximately $4,300,000. An additional 40 miles of trunk sewers ranging from 18 to 90 inches in diameter, plus 11 more pumping stations will cost an additional $15,000,000.

"Operations Begin at San Juan's Puerto Nuevo Sewage Treatment Plant." *The American City*, May, 1958.

Jersey City's Sewerage Facilities

In July, 1957, thirteen years of effort culminated in the first operation of two new sewage treatment plants in Jersey City, N. J., a city of 300,000 population located on the west bank of the Hudson River across from lower Manhattan. The city is separated into two slopes by a ridge running north and south necessitating two separate treatment plants. Jersey City is in a Class "B" zone, as designated by the Interstate Sanitary Commission, which zone requires the removal of all floating solids and at least 10% of the suspended solids together with such reduction in biochemical oxygen demand as is needed to maintain the dissolved oxygen content in the receiving waters at more than 30% saturation. These desired ends are accomplished by primary sewage treatment. The West Side Plant is designed for a plant capacity of 36 mgd and the East Side Plant for 46.62 mgd. The treatment at the East Side Plant includes sequential screening, grit removal, pumping, flow measurement, sedimentation, sludge removal, and effluent chlorination. The West Side Plant includes the same process plus sludge digestion and sludge disposal. The gas from the digesters is used to heat the dual fuel boilers and for power generation. The clarified effluent from both plants is chlorinated before final discharge. Total cost of the two plants was about $17,000,000.

"Jersey City Pollution Abatement Facilities." By David L. Gallagher. *Water and Sewage Works*, May, 1958.

Sewer System Improvements

A few years ago Ravenna, Ohio, was confronted with serious problems in its sanitary sewerage system. This city with a population of 10,000 and an area of approximately 3 square miles has diversified industries, the principal ones being in the metal working and rubber products fields. Its topography is rolling, thereby complicating the design of sewers. In order to bring all the sewage to one plant for treatment, lift stations, force mains, and siphons are needed. As a result of a comprehensive study of the system several recommendations for improvements were made. One of the principal items of sewer work consisted of the installation of a new 18-inch asbestos-cement pipe line siphon from the principal gathering point to the treatment plant. This new line plus the old 10-inch line will have a capacity over 4 mgd, which is the present plant capacity. New sewers and lift stations were installed to serve the newer sections of the city which are being rapidly developed. All the new sewers are designed to care for the estimated needs of the city in 2003 and are based on a population of 16,500. The sewage treatment plant as it existed prior to the present improvement program was a primary plant only. The improved plant is designed to handle the sewage of 1980 from an estimated population of 13,500 persons plus the ordinary industrial load from the diversified industries whose wastes in general are not objectionable. The plant im-

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provements consisted of adding a comminutor and grit handling equipment; rebuilding the preaeration tank equipment; adding mechanically aerated activated sludge tanks and settling tanks; cleaning the digesters and repairing the roof and enlarging the open sludge beds. The total project cost of the improvements amounted to slightly less than $1,480,000.

"Comprehensive Study Leads to Improvements of Sanitary Sewer System." By Grant M. Hinkamp. PUBLIC WORKS, June, 1958.

Other Articles

"Units of Expression for Wastes and Waste Treatment." Manual of Practice No. 6. The publication of this manual of practice is in answer to the recognized need for standard units of expression for factors used in these sanitary engineering activities. Sewage and Industrial Wastes, May, 1958.

"Economics of Pollution Control." This article emphasizes that there are both **benefits and costs associated with pollution** and that on optimum solution to the problem cannot be reached without taking into account both and balancing at the margin the incremental benefits against the incremental costs. By Edward F. Renshaw. Sewage and Industrial Wastes, May, 1958.

"Hydraulic Testing of **Centrifugal Pumps.**" A discussion of the factors involved in performing laboratory and field tests to determine if the guaranteed hydraulic performance of a pump has met specifications as denoted in contracts. By Mel Mann. Public Works, June, 1958.

"Velocity-Controlled **Sewage Siphons** Solve Pumping Problems." Two sewage siphons were constructed to convey 80% of the domestic wastes of Peekskill, N.Y., to the treatment plant, a distance of about 6,000 ft., and the first to operate on an automatic and velocity-controlled basis. By Thomas M. Riddick. Public Works, June, 1958.

"Digestion Control with Gas Diffusion." High rate anaerobic sludge digestion may be accomplished through continuous solids loading, uniform temperature control and uniform distribution of raw and digesting sludge in the digester through gas diffusion. By Philip F. Morgan and Peter J. Neuspid. Water and Sewage Works, May, 1958.

"Good **Refuse Containers** Come First.". . . in Hammond's city-wide sanitation program. By Dr. D. T. Ramker. The American City, May, 1958.

"Owensboro, Ky. Helps **Clean Up the Ohio.**" New sewage treatment plant designed to fit the overall pollution abatement program established to reclaim the Ohio River. By J. A. Hetter. The American City, May, 1958.

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City Takes Pride in Street Cleanliness

● THIS Wayne sweeper gets plenty of use on the streets of Russell, Kansas.

CLEAN STREETS are a subject of municipal pride in the City of Russell, Kansas, where careful planning and the hard work of competent employees, coupled with efficient equipment, have produced very fine results.

The business district is swept two or three times a week and the residential districts as often as needed. When cars are parked in the business district at the time the sweeper is operating, an employee of the Sanitation Department cleans around the parked cars with a hand sweeper. Although this is not a frequent practice, it is necessary for cleaning places that otherwise would go untouched.

The regular operator, Mr. Dietz, has been employed by the City for five years. He can be seen in the picture aboard the City's 1953 Wayne Motor Sweeper, Model 1-50. In 1957 he spent 816 man-hours in the street cleaning program, during which time he cleaned more than 1100 miles of streets. The cost of this program was less than $3,000 for the year.

This information and the photograph were provided by Marvin Simonton, City Engineer of Russell, Kansas.

Design of a Unique Small Sewage Plant

ONE of the smallest and most unusual sewage treatment plants in the country, incorporating complete treatment, has been designed by Rader & Associates, Engineers and Architects of Miami, Fla. The plant has been constructed for the Delray Shores Water Company at the northwest edge of Delray Beach by the Murphy Construction Company at a completed cost of $32,000. Initial design was based on serving 215 homes with a population of 750 people and a daily contribution of sewage, including infiltration, of 100 gpcd or a total of 75,000 gallons of domestic sewage. However, experience with other treatment plants in the area which have been designed by these engineers indicates that this plant will be able properly to treat the sewage from as many as 300 to 400 houses.

Sewage is pumped to the plant and the plant effluent is discharged into a drainage canal. Primary sedimentation is accomplished in a hopper bottom tank 16 ft. by 10 ft. by 8.5 ft. swd. Design flow, including recirculation, is 116,000 gallons per day, and the tank provides a detention period of 1.86 hours with a surface loading of 727 gallons per day per square foot and an overflow rate of 11,600 gallons per day per foot of weir. Sludge is removed by gravity to a sludge inspection box from which it is pumped to a digester having a capacity of 2,785 cubic feet or 3.71 cubic feet per capita. No

heating or cover is provided. Supernatant is discharged from either of three selection points to a recirculation pit and returned to the plant influent. Sludge can be recirculated through the sludge inspection box. No sludge drying beds were constructed at this time. Effluent from the primary clarifier is discharged to a pump sump and then is pumped to a conical bottom tank feeding a fixed nozzle distributing system dosing a trickling filter.

The dosing pump is float controlled, and the varying head provided by the feed tank causes the fixed nozzles to discharge in circles of varying radii, providing thorough wetting and even discharge upon the surface of the filter. The high rate trickling filter is 24.67 ft. by 10.67 ft. with 4-ft. depth of media. Design loading is 19.1 mgad and 3,070 pounds of BOD per acre foot per day. Filter media is Birmingham slag passing 4-in. square openings and retained on 2-inch. The filter can be flooded.

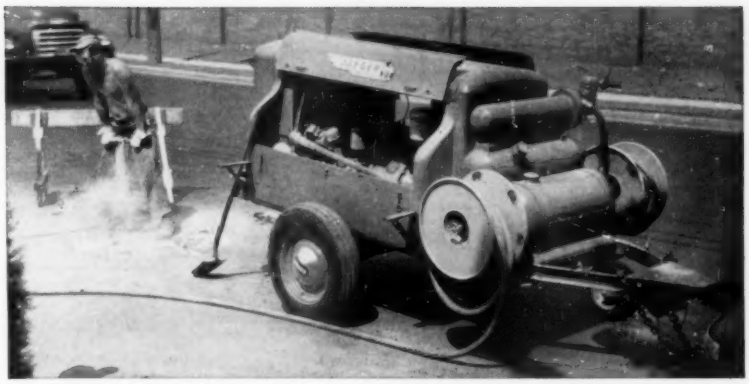
The secondary sedimentation unit is 24 ft. by 10 ft. by 4 ft. swd. Design flow detention period is 2.30 hours with a surface loading of 313 gallons per day per square foot and an overflow rate of 7,500 gallons per day per foot of weir. A gas chlorinator is provided and a chlorine detention tank is used for adequate disinfection.

This plant is constructed of concrete blocks and stucco. By taking full advantage of common wall construction, structural costs were held to a minimum. The trickling filter is built above the secondary clarifier, thus further reducing the size of the overall plant. Costs on this plant were held to a low figure, partly through minimum use of equipment —three pumps, one chlorinator, dosing nozzles and piping.

• • •

Water Resources Council Awards Plaque

The Water Resources Council awarded the first National Clean Streams Emblem to the City of Philadelphia on June 11. The ceremony commemorated also the golden anniversary of conservation with the presentation of the Pinchot Conservation Plaque by Mrs. Gifford Pinchot to Admiral M. F. Draemel, USN (Ret'd.). Major Richardson Dilworth of Philadelphia received the Water Resources Council presentation from Arthur S. Flemming who has been designated as the Secretary of Health, Education and Welfare by President Eisenhower.



Note full size tool boxes, retractable dolly, spring towing eye.

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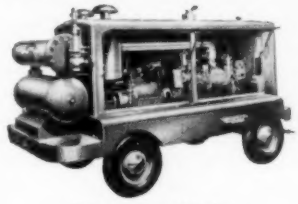

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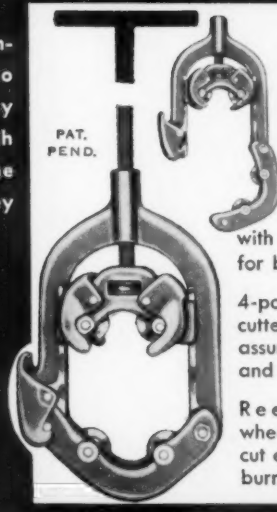

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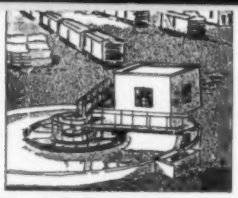


PUBLIC WORKS DIGESTS

Prepared by
CLAYTON H. BILLINGS
Associate Editor

THE INDUSTRIAL WASTE DIGEST

Deep Well Waste Disposal

Pumping of industrial wastes underground is not a new procedure, the practice having been employed in Michigan, Texas, Arkansas, Kentucky, and California. In each case, disposal areas lie well below the lowest levels of fresh water and are isolated above and below by impervious formations. The discovery of means of evaluating underground rock formations in advance of injection of wastes, however, is new and opens a field for solving difficult pollution problems. The testing procedure involves a study of the waste characteristics, a study of the rock formations concerned and their compatability with the waste, construction of a test well and injection of a harmless liquid simulating the waste in viscosity to obtain information on flow characteristics and capacity. Continuous flow and pressure recording instruments give evidence of the success of the disposal operation. Assuming an electrical cost per kwh of one cent and a quantity of waste of 500,000 gal. per 24 hr., the estimated operating cost for a typical installation is $95 per day, of which $80 is pumping expense. A ramification of this method is an arrangement between the City of Midland, Texas, and an oil company, whereby the company will purchase sewage treatment effluent from the city to inject in deep wells for repressuring an oil field.

"Underground Waste Disposal." By William B. Black. *Sewage and Industrial Wastes*, May, 1958.

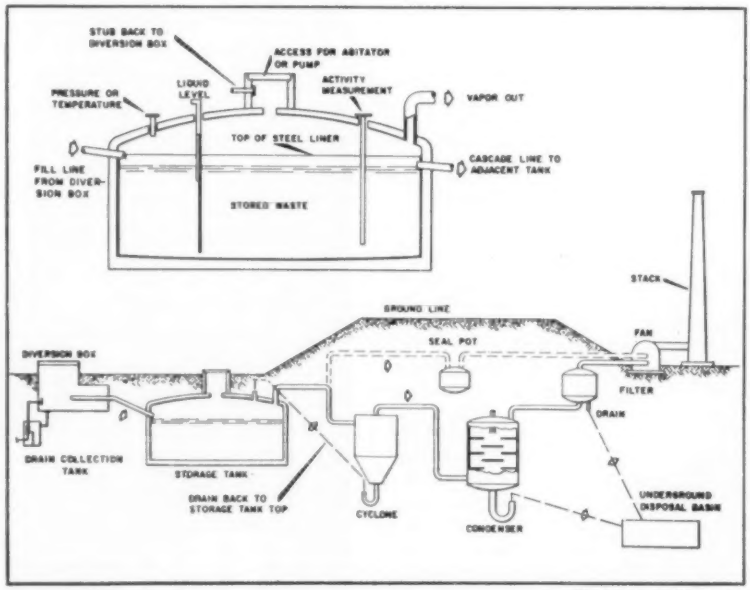
Wastes from Reactor Fuel Processing

High level radioactive wastes originate mostly from the chemical processing of spent fuel for the recovery of the fissionable material. Irradiated fuels from the reactor are stored under water for 90 to 120 days to permit decay, following which they are subjected to processing. The separations processes being used or studied include precipitation, ion exchange, high temperature processing, and pyroprocessing. Typical reactor-fuel processing wastes contain fission products and some fissionable material and are highly acid, making storing them in stainless steel tanks or mild steel lined concrete tanks necessary. Because of the expanding nature of nuclear power development, the location of facilities for storage of the wastes is presenting a difficult problem, and more satisfactory and permanent methods of disposal are being studied. Storage is not being abandoned because, on a kilowatt-hour basis the cost is not high. Removal of Sr^{90} and Ga^{137} from the wastes and separate storage of the remainder will permit relatively short-term storage (about 20 years). This separation might permit release of the residual activity into the ground or the ocean. An investigation at the Oak Ridge National Laboratory concerns removal of specific radionuclides by precipitation and solvent extraction. By separate storage of the more hazardous fraction, less storage space will have to be provided with less elaborate facilities for the bulk of the waste, and there will be no self-boiling of the wastes, obviating the need for cooling.

"Atomic Energy Program, for Waste Disposal. Part II." By Conrad P. Straub. *Industrial Wastes*, May-June, 1958.

Dust Control At Calcium Carbide Plant

Originally ferro-alloy and calcium carbide plants were built in isolated areas because, by their nature, they present problems in air pollution. Development of areas surrounding the plants has made necessary equipment installations for dust and fume control. In an effort to minimize the dust problem from calcining lime, the Niagara Falls plant of Electro Metallurgical Co. installed an experimental Pease-Anthony cyclone scrubber in 1954. Tests showed dust emission was controlled to the extent of 0.0626 lb. per 1,000 lbs. of gases, well within the provisions of the Niagara Falls Air Pollution Control Code. New scrubbers installed on two additional



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kilns each have capacities of 107,000 cfm inlet gas at 1,350°F. They operate on the principle that finely atomized water passing radially through the spinning gas stream collects dust particles and sweeps them to the wall of the scrubber. The clean gas leaves through the top, the impinged water and dust run down the wall and through a bottom drain connection. The spin velocity is controlled by adjustable dampers. Two of the scrubbers are equipped with fans having capacities of 55,000 cfm at 160°F and 9-in. standard pressure each. The third one is rated at 42,000 cfm. The sludge is handled by two 1500-gpm slurry pumps, which transfer the sludge from a common collecting pit to a circular clarifier for sludge thickening. Automatic float controls actuate the sludge pumps, and pressure controls are provided for pumps supplying water to the scrubbers. The gas temperature at the inlet ducts, water flow in the lines to the scrubbers, and water pressure are continually recorded. Alarms sound when high or low limits are reached. The fans are provided with zero speed switches which sound an alarm if the fan speed drops below 300 rpm.

Open-top calcium carbide electric furnaces were replaced with specially designed covered furnaces to effect fume control. The fumes are collected and are drawn through scrubbers where particles are removed centrifugally by water sprays. A further air pollution control measure involved replacing smoke-producing steam locomotives used for in-plant transportation with diesel locomotives.

"Dust Emission Control Program at Electromet." By S. S. Blackmore. *Industrial Wastes*, May-June, 1958.

Modernized Acid Pickling Waste Treatment

While the Bethlehem Steel Co. industrial wastes treatment plant at Williamsport, Pa., originally produced an effluent meeting state standards for the discharge of acid pickling wastes from metallurgical plants, the corrosive nature of the effluent caused trouble at the pumping station. The existing treatment method consisted of neutralization of the acid wastes with lime slurry followed by aeration. To effect improved treatment to neutralize 13,400 lbs. of acid per 24 hrs., new facilities have been designed for a maximum flow of 200 gpm using calcium hydroxide containing 71 percent calcium oxide. Nearly complete iron removal will be effected by aeration at the experimentally determined rate of 0.5 cu. ft. of air per gallon with an aeration time of four minutes. The additional unit (Infilco's Cyclator) receives the effluent from the existing neutralization tank after a secondary lime slurry addition. Automatic control of the secondary lime slurry feed is provided by means of a continuously operating pH controller. Air is introduced into the reaction zone of the Cyclator. Sludge drawoff is time controlled.

"Bethlehem Steel Improves Acid Pickling Wastes Treatment Plant." By F. B. Milligan. *Wastes Engineering*, May, 1958.

Pure Organic Compound BOD Values

To enable calculation of the BOD load imposed by a pure organic compound on a waste treatment process, it is necessary to develop reliable values for the pure compounds, unaffected by conditions of the BOD determination. In attempting to evaluate the BOD of the lower fatty acids, various factors were studied, along with their effect on the BOD of acetic acid. These included the BOD method employed,

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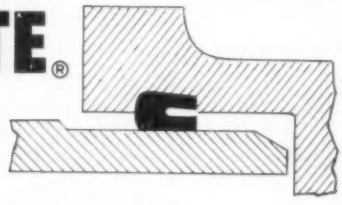

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the cation to which the radical is attached, nitrogen and phosphorous concentration in the dilution water, nitrogen source, acid concentration, and quality and concentration of the seed. It was found that the cation had no observed effect on oxidation of the acetic acid radical. The standard dilution, jug dilution, and Warburg methods of BOD determination gave comparable results. Sewage quality has a great effect on the oxygen demand of 10,000 ppm of the organic acids, but the volume of sewage as seed did not have such a pronounced effect. Where long lag periods are encountered in the oxidation of high concentrations of the fatty acids, it is possible to develop an adapted seed through successive transfers of seed material, to reduce the lag period. It was found that the 5-day BOD values of the lower fatty acids in concentrations of 2 to 10,000 ppm represent approximately 67 ± 3 percent of the theoretical oxygen demand to oxidize the compound to CO_2 and H_2O, excluding the 5-day value for capric acid. Based on direct measurement after a 20-day incubation period and on calculation by the moments method, the 5-day BOD values were 91 ± 4 percent of the ultimate oxygen demand.

"Oxygen Demand of the Lower Fatty Acids." By P. E. Gaffney and H. Heukelekian. *Sewage and Industrial Wastes*, May, 1958.

Resume of Packinghouse Waste Disposal Practices

While nearly all packinghouse plants recover blood for sale as an ingredient in animal feed, it remains the largest single waste from accumulation on the killing floor reaching the sewer during wash-up operations. Paunch manure, consisting mainly of undigested hay, must be screened out of sewage at the packinghouse if the municipal plant does not have the facilities to handle the load. Trimmings and scrap reaching the killing floor should be kept out of sewers. In the handling and cleaning of the intestines, fat should be recovered in grease traps for later rendering. Fecal material can be satisfactorily discharged to the sewer. In the larger plants, processes contributing to pollution load include hog hair removal, rendering, tripe cleaning, sausage operations, and glue manufacturing. Labor saving practices are rapidly entering the field to effect more economical recovery of waste products. Hair processing plants and glue plants can be automated and instrument controlled. In the final analy-

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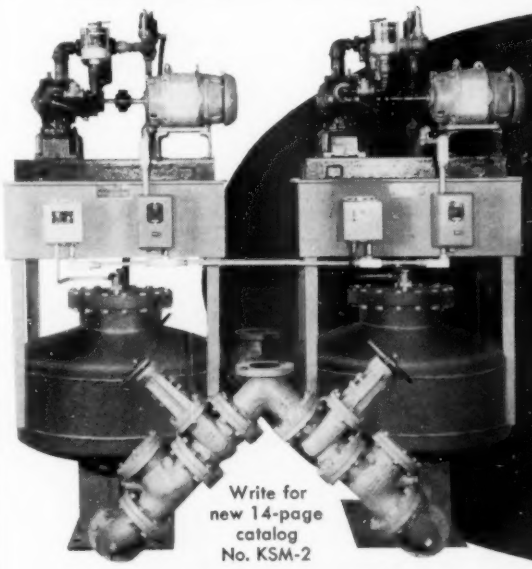

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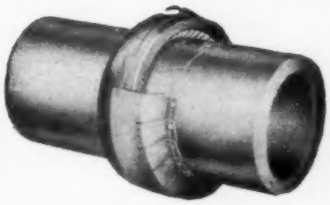

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sis, everything is theoretically subject to recovery except fecal material and dirt and scurf from hair removal. These, plus wash water, are the wastes that must be considered in sewage treatment and amenable to biological treatment processes. Consequently, the most satisfactory method is to treat them in conjunction with domestic sewage. Recently, Wilson and Co. placed in operation at Albert Lea, Minn. a plant employing an anaerobic method of treatment. The design of the plant was predicated on data developed in a research project sponsored by the American Meat Institute and supervised by George Schroepfer of the University of Minnesota.

"Meat Packing Waste Disposal." By G. A. Aikins. *Industrial Wastes*, May-June, 1958.

Other Articles

"Observation and Measurement on **Refinery Wastes.**" By F. J. Ludzack, F. M. Middleton, and M. B. Ettinger. This summary of the work done on oily wastes at the R. A. Taft Sanitary Engineering Center shows that some progress has been made in measuring oil refinery pollutants and in understanding the role of these wastes as industrial pollutants. The procedures in general are tedious and expensive and lack specificity. Research is needed. Sewage and Industrial Wastes, May, 1958.

"**Fertilizer** of the Future." By Jerome Olds. Cheap sources of organic matter are virtual necessities to almost every gardener and farmer. Waste materials from industry can furnish both organic matter and needed minerals for the soil. Industrial Wastes, May-June, 1958.

"Disposal of **Radioactive Waste.**" By Linvil G. Rich. Among solutions offered for disposal of high-level wastes is discharging them to cavities in abandoned salt mines. Consulting Engineer, May, 1958.

"**Trade Effluent Treatment** at Vauxhall Motor Plants." Batch processes are used at the Luton, England, plant for handling cyanides, acids, and soluble oils. The Surveyor, May 3, 1958.

"Safe Disposal of Waste from **Atomic Energy Establishments.**" By B. A. J. Lister. In England, the biological and genetic aspects of the radioactive waste hazard call for control measures on a national rather than local basis. The Surveyor, May 10, 1958.

• • •

Dust Laying Materials

Wayne County, Michigan, used approximately 135,000 tons of calcium chloride for dust control during 1957. Also used were approximately 50,000 gals. of oil for the same purpose.

Using Bulk Chemicals in Water Treatment

EQUIPMENT FOR HANDLING BULK CHEMICALS

DONALD B. WARD,

Chief Chemist,
San Jacinto Water System,
City of Houston, Texas

IN THE HOUSTON Water Purification Plant, an attempt has been made to integrate some of the latest developments in industrial design with time proven principles of municipal water treatment. The plant embodies no radical departures from accepted treatment methods, but being uninhibited by older structures its functional design results, we believe, in an engineering and architectural integration of efficiency, economy and pleasing appearance.

The plant is built for an ultimate capacity of 100 mgd and is initially equipped for a capacity of 33 mgd. Inasmuch as the Lake Houston water is low in hardness, alkalinity and turbidity, the treatment process is not complex. A water of high quality is obtained through prechlorination, coagulation with alum, sedimentation, filtration, stabilization with lime, and post chlorination. Activated carbon can be introduced as needed in dealing with taste and odor problems.

This article is based on two papers presented at the Texas Water and Sewage Works Association Short School, Texas A. and M. College, March, 1958.

Bulk chemicals are received at the purification plant in hopper bottom freight cars, rubber lined tank cars, and multi-unit chlorine tank cars. Chemical shipments, with the exception of chlorine, are sampled and examined by the laboratory before acceptance for unloading.

Liquid alum is shipped in rubber lined tank cars containing approximately 10,000 gallons of solution with 8.25 percent available Al_2O_3. The contents of the tank car are unloaded by air pressure into a 16,000-gallon rubber lined storage tank. Feeding of the liquid alum is accomplished by pumping the concentrated alum solution into a "Roto dip" feeder which varies the feed rate in proportion to the raw water flow. The measured feed solution is diluted and fed to the water at the first stage of the rapid mix units. The liquid alum feed equipment has a maximum feed capacity of 4.65 gpg at 100-mgd pumpage and is 98 percent accurate over the entire feed range.

Bulk quicklime is received in hopper bottom, covered cars containing approximately 50 tons of pebble lime. A combination of bucket and screw conveyors unload the lime at the rate of 730 cubic feet per hour. The lime is stored in a silo having a capacity of 110 tons. From the silo, the lime travels through a series of conveyors to the feed equipment where the lime is slaked and gravity fed.

The lime slakers are loss-in-weight Omega feeders with a ca-

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pacity of 750 pounds per hour. Feed lines for the application of lime are arranged in such a manner as to allow the addition of lime to the raw or filtered water.

When the liquid alum installation was completed, the bulk handling equipment for crystal alum was placed on standby status. The standby equipment is identical to the facilities for handling quicklime with the exception of storage and feeder capacity. The storage capacity for crystal alum is 260 tons, and each dry feeder has a capacity of 2700 pounds per hour.

Activated carbon shipments are also received in hopper bottom cars containing approximately 12.5 tons per car. The carbon is stored in two carbon slurry tanks with a capacity of 21 tons at a slurry ratio of 1 pound of carbon per gallon of water. Prior to the arrival of each carbon car the storage tank to be charged is half filled with water and a period of 72 hours is allowed for the carbon to dissolve. After it has been determined that all the carbon is in solution, the agitators are started and the solution diluted to the desired consistency. The carbon feed rate is measured by "Roto dip" feeders with a capacity of 1600 pounds per hour. Ejectors carry the measured solution from the feeders to the final stage of flocculation. This point of application has proven to be very efficient.

Multi-unit chlorine tank cars, containing 15 tons of chlorine each are delivered to the plant and placed directly under the overhead cranes, by which the chlorine cylinders are unloaded and transported to the cylinder room. Liquid chlorine is withdrawn from the cylinders and passed through the evaporators where it is converted to a gas. The chlorine then travels through the chlorine feed equipment for application to the various treatment points. The numerous points of chlorine application have resulted in increased efficiency and economy. Chlorine may be applied to the raw, settled, filtered or finished water.

During the past two years the storage of bagged chemicals has been limited due to the availability of these chemicals in the immediate area. Duplication of chemical feed equipment at the Purification Plant insures the continuation of service when faced with mechanical failures or routine maintenance.

EFFECTING ECONOMIES IN PURCHASING BULK CHEMICALS

CLYDE R. HARVILL,

Superintendent,
San Jacinto Water System,
City of Houston, Texas

AT HOUSTON, the liquid alum in railroad tank cars is unloaded by one man in about six hours if seven pounds of air pressure is used or in about three hours using 16 pounds of air pressure. The savings in using liquid alum over crystal alum is $14.50 per ton, and in January 1958, this amounted to $3.32 per mg or $1821 net saving. One man unloads a car containing 40 tons of crystal alum in about six hours. Alum in bulk compared to bagged material is $1 per ton cheaper.

The activated carbon, in hopper bottom railroad cars of about 12 tons, can be unloaded by two men in two days. One-half the car is unloaded one day, allowing the carbon to go into solution in a storage tank over night, and the remaining one-half car, the following day. Carbon in bulk is obtained at a saving of $104.30 per ton compared with carbon in paper bags, not including much higher labor costs of handling bags.

One man unloads the 50-ton car containing pebbled quicklime in about six hours. Quicklime in bulk represents a saving of $6.16 per ton compared to bagged material which again does not include higher labor handling costs.

Two men unload the 15 containers of chlorine from multi-unit tank cars and load empty containers on the car in about three hours. Chlorine in these ton containers costs $156.93 less per ton than in 150-pound cylinders. Chlorine in railroad tank cars costs $19.07 less per ton than when obtained in ton containers. It is the present plan to start getting chlorine in railroad tank cars.

OPERATOR TRAINING—*Key to Effective Sewage Treatment*

HARRIS F. SEIDEL,

Superintendent, Water & Sewage Treatment,
Ames, Iowa

MANY SMALL and medium-sized sewage treatment plants never produce the expected results. Among the possible explanations may be an overload; an unexpected load of an industrial waste not amenable to treatment; or it may be poor design of the plant.

The key to the situation in any case, and the most important factor in effective sewage treatment, is the plant operator. The purpose of this paper is to take a quick look at his problems and to summarize the results of the program in Iowa that is designed to help the operator help himself.

Let us assume the assignment of visiting a number of smaller plants, selected at random. In a discouragingly high proportion we would find an operator struggling along without proper tools, records, laboratory facilities, plans, sufficient help when needed, a budget to meet his needs and, almost invariably, **without** training in the job he was expected to do.

However, at most plants we would find a conscientious public employee, working long hours for little pay, doing the best he could, performing the duties outlined to him by a previous operator; or often without benefit of even this "training."

From the city's standpoint, sewage treatment is far down the list of municipal activities which generate interest. In contrast to water or electric service, its benefits are seldom tangible; once built, the plant is easily forgotten.

Salaries are generally less than those paid for equivalent jobs in other utilities or departments. This lends itself to the sort of vicious circle in which the men are not so good as they might be because the pay is low and the pay remains low because of the caliber of employee in the job.

Many small sewage treatment plants represent a first cost of several hundred thousand dollars—an investment which not only may be,

but often is, virtually destroyed in 8 or 10 years by lack of intelligent operation and adequate maintenance. Every engineer and administrator will recognize that this is anything but cheap.

Is there any help for this somewhat depressing situation? Recent experience in Iowa would certainly indicate there is, for, starting from scratch 5 years ago, Iowa now boasts over 250 certified operators and continuing, enthusiastic demand for operator training.

Operator Certification

After extensive study, the Iowa Sewage and Industrial Wastes Association adopted in 1952 a voluntary certification for a licensing program. In barest outline form, the program provides for: Classification of plants from Group I (largest and most complex) to Group IV (smallest and least complex); corresponding classification of operators from Grade I to Grade IV, based on education, experience and technical qualifications necessary; written examinations for Grades I, II and III; and a system of administrative procedures and very nominal fees for support of the certification program.

The program is administered by the Certification Committee of ISIWA, composed of two plant operators, an engineering educator, a consulting engineer, an elected city official and a State Health Department engineer who serves as secretary-treasurer of the group. Appointments are for three-year terms which overlap to insure continuity.

Throughout the program, emphasis has been solidly on the service potential of better sewage treatment —what the well-trained operator can do for his city and the general public, rather than what certification will do for operators singly or as a group.

In its initial two years, the program produced two things: First, a total of 91 certified operators; second, an unexpected but quite vocal demand for some source of education or training better to prepare operators for the certification examinations.

Operator Training History

To meet the need (actually to take a hard look at it first) an Education Committee was appointed by ISIWA in 1954. This group of six consisted of two operators, a consulting engineer, a Health Department engineer and one educator from each of the two state schools offering a sanitary engineering curriculum.

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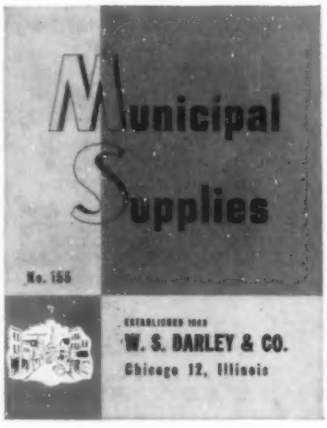

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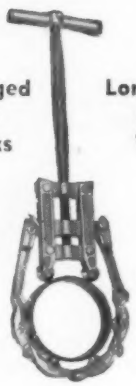

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In the spring of 1955 a trial of a pilot course was offered in Ames for some 20 nearby operators. From this and succeeding courses offered across Iowa, the following pattern has emerged.

The education program is sponsored jointly by ISIWA, the State Health Department, and by the State University (Iowa City) and the State College (Ames). The basic training course consists of 8 evening sessions, one a week, concluded by the certification examination the 9th week for those desiring it.

Instruction is largely by staff members from the two schools, but with considerable help from operators and superintendents of the larger plants. The sessions, usually held in a municipal or school building, are quite informal. Discussion is encouraged, and the 10 o'clock closing time is usually over-run.

Including the trial run, this basic training course has now been given 12 times throughout the state to over 200 men. Its success is due to the skillful blend of a good product with a touch of the hard sell. The course has never been pushed into a new area; rather, it is scheduled only after requests for it are received. But once a course is scheduled, every eligible operator is contacted personally, either by an interested neighbor or by the local public health engineer. If it seems wise, the mayor or councilman concerned will also be approached at the same time. This approach has never failed to yield a respectable attendance.

A registration fee of $20 (this is where the city officials become involved) is charged for the course. Not a single instance has come to light of the operator paying his own fee. The $20 fee meets the cost of materials and travel expenses incurred by the instructor; it of course leaves nothing for compensation of the instructors. However, this training program has now been accepted under the Extension Division of Iowa State College, thus qualifying as a partial teaching load for one man and thereby relieving the burden of a completely voluntary teaching effort.

The success of this basic training program is indicated by requests for a laboratory course (already given twice) and an advanced training course, now in the planning stage. Attendance records are probably a more unusual indication; attendance for the full course has usually run 95 to 98 percent representing very few single absences for the whole group for the full course.

Still another indication is the compliment paid an operator group at a recent district meeting, to the effect that they were a solid cut above the same group of four or five years earlier; which was particularly significant because most of them were the same men.

To meet the very serious need in the smaller plants, and to capitalize on the fine work being done in several parts of the country, it would appear that a broader approach, combining the experience and efforts of many, would be most practical. Such an approach might be outlined roughly as follows: 1) Correlate, draw from and build upon current successful programs; 2) on request, help local groups develop their own training and certification programs; 3) direct the development of such operator services as a simple laboratory manual and a safety program; and 4) work toward a public relations program particularly aimed at helping responsible public officials understand that the most economical sewage treatment is achieved by operators who are well qualified, well trained and well paid.

What organization could best handle such a broad effort? It would appear that the Federation of Sewage & Industrial Wastes Association is the only non-governmental body in any way equipped to tackle this job. An alternate sponsor might be the U. S. Public Health Service. Certainly it is difficult to suggest any segment of the public which would fail to receive some benefit from such a program.

Summary

It should be re-emphasized that the need for operator development is greatest at the level of small and moderate-sized plants; the larger plants generally have professional or other competent supervision and are operated on a sound financial basis as well. The small plant operator has little or no help of any kind available to him.

The Iowa operator training and certification programs have been strikingly successful partly because they rest upon sound, hard, dedicated committee work and partly because they met and filled a need that was even more real and widespread than anticipated.

It is felt that such a program can survive and realize its highest potential only in terms of service rather than gain and if the service motive is genuinely uppermost, recognition and reward will follow in due course, raising this field of public service to the status it deserves.

Ditch Maintenance Labor Cut 90 Percent

A BACKHOE and loader combination by Davis, mounted on a M-H tractor is used for ditch maintenance by Middlesex Co., New Jersey. Savings up to 90 percent in man-hours of labor, as compared to manual digging are reported. The Davis M-H unit averages 500 feet per 8-hr. day. The digging is with the backhoe at an angle permitting the tractor to operate on firm ground. Ditches range from 18 ins. to 12 ft. deep, drainage pipe being laid in the latter. Middlesex County's road department maintains approximately 40,000 feet of drainage ditches throughout the county.

● **BACKHOE-Loader cleans drainage ditch on a New Jersey county road.**

Equipment Leasing

(*Continued from page* 96)

"The rates in the schedules are all f.o.b. the lessor's warehouse or shipping point. The lessee pays the freight or drayage charges from shipping point to destination and return. When loading, unloading, dismantling or assembling is necessary, the lessee pays the additional charge. On local rentals the rate starts when the equipment leaves a lessor's warehouse and stops when it is returned to such warehouse. On out-of-town shipments, the rental starts on the date of the bill of lading of shipment and stops on the return bill of lading. Rentals are payable in advance, and subject to the terms and conditions of the lessor's rental contract. No insurance, license, sale or use taxes are included in these rates."

It might also be pointed out that while equipment is normally rented without driver, arrangements for such can often be made.

In those states with constitutional or statutory provisions against incurring indebtedness beyond the income and revenue provided for the year, the lease purchase agreement may meet a special need. This need arises in those cities where the lack of sufficient available funds make it impossible for the city to pledge itself to purchase vehicles with the current year income. However, there is the difficult legal question of whether a lease-agreement with option to purchase is in fact a contract to purchase; if it is a contract, it would be illegal in many states. Following a study of this problem some years ago the League of California Cities concluded that in order to be absolutely safe from court action it is preferable not to allow credit on the purchase price stated in the option for any of the rental previously paid. The League suggested that the lease instrument be drawn in such a way that rental is a reasonable amount representing the rental value of the equipment. If an option to purchase is included in the lease it should provide for acquiring the equipment at a definite price with no credit given for rental payments previously made. The purchase option could legally extend to the city the right to purchase the equipment at any time at its prescribed depreciated value. A schedule of depreciation set forth in the lease could be the basis for this.

Many communities, large and small, prefer to reimburse their employees for the use of private cars on the basis of numbers of miles travelled. In many cases this is done without careful examination of the relative advantages of this system as compared with city ownership or with leasing arrangements. There seems to be a fair degree of agreement among officials of private business or public service enterprises concerned with the operation of vehicle fleets that there is a cut-off point with regard to number of miles travelled by passenger cars, below which it is not advisable to lease equipment because employee reimbursement is more economical. This figure fluctuates with the local situation, but is probably in the neighborhood of 18,000 to 22,000 miles per year.

Employee reimbursement is sometimes more economical than leasing or city ownership, but these instances are confined largely to cases of low mileage or infrequent movement. Employees who do very little travel or travel only infrequently may perhaps be served more economically by a city owned vehicle

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placed in a motor pool. In any case, at very low mileages leasing companies cannot compete with employee reimbursement or city ownership. At mileages approaching 18,000 per year, the city may, for more reasons than one, be able to save money by owning or leasing instead of reimbursing employees. There is the case, for example, of a company operating approximately 100 salesman-owned cars. Under a system of salesmen ownership it was found that the average mileage travelled per salesman was approximately 36,000 miles per year. When the company changed over to leased cars the average mileage travelled was reduced to 20,000 miles per year per salesman. Human nature being what it is, this magical change could take place in almost any city.

In the debate between employee reimbursement, leasing of equipment, and city ownership, most of the arguments as to the relative costs lie with city ownership. Yet, there are varying conditions calling in one case for rental, in another for payments to employees for using their own cars, and in still another for public ownership. The checklist below, while it is not by any means an infallible guide, will serve to indicate under what conditions each of the three options is usually best.

Pay Employees when: 1) individual automobile mileage is low; 2) travel involves long periods when the car is idle; 3) the city's vehicle fleet is small; 4) legal and/or fiscal problems would make city purchase or lease difficult; 5) individual vehicle mileage is about 18,000/yr. or less and vehicles are currently being leased; and 6) individual vehicle mileage is about 10-12,000 miles/yr. or less and the current system is city ownership.

Lease when: 1) the item of motor equipment has a high capital cost and the city would have difficulty setting aside that much money for one year; 2) it is an expensive item and receives infrequent use; 3) a necessary skilled operator would be difficult for the city to train or to acquire and retain; 4) vehicles operated on an employee-reimbursement basis are recording about 18,000 miles/yr. or more; 5) in the case of a city owned fleet when the city garage is inefficient, or when the city cannot or does not hire reasonably competent mechanics; 6) the item is apt to be obsolete shortly due to mechanical advances; 7) legal, fiscal or political problems would prohibit city purchase and when employee reimbursement would be more expensive than leasing; 8) it is desirable or necessary to have a guarantee of immediate replacement of the vehicle when it is out of service; 9) "peak load" or emergency demand cannot be met economically through a city "pool" or through payments to employees for the use of their cars; and 10) the organization is small and the type of equipment or its use would call for unusually high maintenance costs.

City Own, Operate, and Maintain when: 1) the auto fleet is "sizable" —perhaps 15 or more (this is an arbitrary figure which will vary widely with local conditions;) 2) a city vehicle would not be idle for a large proportion of the time if assigned directly or through a "pool" to an employee traveling only intermittently, or for short mileage; 3) the city can hire competent mechanics; 4) the city maintenance facilities are satisfactory and are well-managed; 5) the mileage of autos operated under a leasing or employee reimbursement arrangement amounts to or exceeds approximately 10-12,000 miles/yr. per car; 6) there are no legal or fiscal obstacles to purchase; and in the case of heavy equipment, good operators can be hired; it is unlikely to become obsolescent before the

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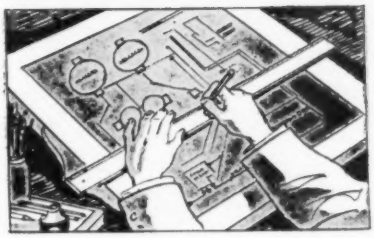

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end of its normal useful life; it is used regularly or often; the necessary funds can be found to make the purchase; and replacement and repair parts are quickly available.

Nearly all of the pros and cons of leasing can be set down in such a factual way. Simple cost records will usually make it possible with systematic analysis to evaluate these pros and cons. In any case, if the factual information is set down, it may not be necessary at all to consider the nonfactual or intangible parts of the decision (such as the wear and tear on management in the necessary supervision of a city fleet). If it is necessary to consider the intangibles the evaluation will be easier because of the factual background. It will be helpful to graph the costs of the three alternative methods. The three curves will indicate the relative advantages of the three methods (city ownership, employee reimbursement, leasing). Without such a factual study any conclusions as to the relative advantages must be tentative at best.

• • •

Small Sewage Treatment Plants—Sludge Digestion

(*Continued from page 82*)

erably automatically, during occupancy.

"*Digester Heating*: Wherever possible, digestion tanks should be constructed above the ground water level and should be suitably insulated with dirt embankments or by other means. Hot water coils for heating digesters should be at least two inches in diameter and the coils as well as the support brackets should be of cast or wrought iron. The use of dissimilar metals should be avoided to minimize galvanic action. The high point in the coils should be vented to avoid air lock. Consideration should be given to heating installations embodying heat exchangers or some form of heating device which can be readily removed from the tank for maintenance. Other methods of heating digesters which may be developed will be considered on their individual merits. Sufficient heating capacity should be provided to maintain the sludge at 85° to 95°F or more at all times. Where digester gas is used for heating, an auxiliary fuel may be required.

"A suitable automatic mixing valve should be provided to temper the boiler water with return coil water so that the inlet water to the coils can be held to a temperature of 140°F or less. Manual control should also be provided by suitable

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by-pass valves. The boiler should be provided with suitable automatic controls to maintain the boiler temperature at 180°F or more to minimize corrosion and to shut off the main gas supply in the event of pilot burner or electrical failure. Thermometers should be provided to show temperature of the sludge, hot water feed, hot water return, and boiler water. Heating calculations should be made for each separate case in accordance with well known principles of heat transfer. The heating system should supply sufficient heat to raise the temperature of the raw sludge from about 45°F to 95°F plus heat required for digester radiation losses. Pacific Flush Tank Company Bulletin #235 indicates the heat requirements to be as follows based upon experience with a larger number of digester installations:

"Btu per hour for raw sludge = Design population in thousands x 8300. Digester losses = 2600 Btu per hour 1000 cubic feet of digester capacity x correction factor. The correction factors are: Southern portion of U.S. —0.3; middle portion of U.S. —0.5; northern portion of P.S. —1.0."

Equipment Available

Equipment available for two story tanks includes the Lakeside "Spiragester" and Dorr-Oliver "Clarigester." These have been previously described in the article on "Sedimentation" (PUBLIC WORKS, February 1958). Similar equipment is available in the R. B. Carter Co. "Cartergester."

For separate sludge digesters, the Pacific Flush Tank Company provides floating covers for circular tanks as small as 10 feet in diameter. Pacific Flush Tank Company also provides automatic heater and heat exchanger combinations particularly suitable for small plants; these may be fired with sludge gas or auxiliary gas or oil or a combination of all three. Also provided by PFT is a complete line of gas safety equipment, supernatant selectors and gauges, cover position indicators and pressure indicating gauges. The PFT-Pearth gas recirculation system is also furnished.

Dorr-Oliver provides the Type MA digester for single stage digestion including high capacity mixing and gas storage and the Dorr multi-digestion system for two stage digestion and sludge gas utilization. Smallest equipment is in the 20-foot diameter range for separate sludge digestion. Dorr-Oliver also furnishes the "Completreator" for very small plants for about 13,000 gallons

per day and less which includes sedimentation, trickling filters and digestion in a single "package." A spiral type external heat exchanger is also available. The Dorr-Oliver "Densludge Process" provides for sludge thickening prior to digestion. Plunger type sludge pumps are also available from Dorr-Oliver.

Chicago Pump Company provides the Catalytic Reduction Process for sludge digestion including the necessary gas compressing and diffusing equipment together. This process may be applied to round or square tanks. This company also provides floating covers and gas holders available in sizes down to 20 feet diameter. The "Chicago Selas" system of digester heating is available down to 250,000 Btu per hour as is the "Chicago Cyclotherm" digester heater and heat exchanger which may be fired with oil, sludge gas or auxiliary gas. This company also furnishes screw feed and plunger type sludge pumps.

Link-Belt Company furnishes scum breaker equipment, gas domes and accessories for rectangular digestion tanks suitable for common wall construction with rectangular settling tanks or as separate structures. This equipment is also available for circular tanks.

Hardinge Company furnishes digester mechanisms for covered tanks.

Ralph B. Carter Company furnishes digester mixing equipment, floating covers, sludge pumps and combination heater and heat exchange units.

Walker Process Company provides gas holders, floating covers and combination heater and heat exchange units together with supernatant selector equipment.

Infilco furnishes digester equipment for covered single and two stage digesters including mixing mechanisms and gas domes.

Yeomans Bros. Company furnishes scum breaking equipment for round tanks as does Eimco Corporation.

A complete line of gas control equipment is available from the Vapor Recovery Systems Company.

Safety equipment for gas leak detection is available from the Mine Safety Appliance Company as are instruments for continuous automatic atmosphere analysis.

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PUBLIC WORKS
EQUIPMENT NEWS

Allis-Chalmers Generator Set

Addition to its line of power producing equipment of a portable lightweight generator set developing 35,000 watts (35 k·v) is announced by Allis-Chalmers. The heart of this new set is the Power-Crater engine. The unit provides either continuous or standby power for construction jobs and it will also serve as a source of auxiliary power for other places where standby power is essential for emergencies arising from power outages. The W-226 has an overall length of 68 ins., is 26 ins. wide and 37 ins. high. It can be operated either by gas or gasoline. For further details write Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wis., or circle **No. 7-1** on the reply card.

Cross Walk Line Striper

Many difficult painting jobs are easily handled by this striping machine

This highly maneuverable striping gun available from the M-B Corp. is ideal for many striping jobs, including cross walks and safety zones at arterials. Compact and portable, the gun carriage is equipped with 25-ft. long hoses hung on the side of the larger line marker. Many difficult painting jobs are easily handled as in close work or hard to get at places. Recommended for the M-B model 6-18 or larger line markers, this new gun dolly greatly increases the versatility of the larger line markers. For full details write M-B Corp., New Holstein, Wisc., or circle **No. 7-2** on the reply card.

Unit fits any commercial motor truck

½-Yd. H-5 Hydrohoe-Hydroshovel

An all-hydraulic combination hoe-shovel has been introduced by Bucyrus-Erie Co. Like the Hydrocrane, the H-5 Hydrohoe-Hydroshovel mounts on any new or used suitable commercial motor truck. The H-5 can be taken to jobs at speeds ranging up to 50 mph. The new unit is available as hoe only, without basic crane or hoist machinery, or it can be made so as to allow quick field conversion to crane or clamshell work. Among features of the H-5 Hydrohoe-Hydroshovel are: 1) Three hydraulic circuits; 2) differential and selector valves allow the operator to concentrate the horsepower where and when it is needed; 3) a total of 189,000 pounds of ram force is provided by the combination of crowd-down, dig and wrist action rams; 4) a solid digging platform is provided by four hydraulically-controlled outriggers; 5) a dipper-wrist action ram generates as much as 10 tons of digging force at the dipper lip; 6) boom telescopes to four feet; and 7) six hand levers and two foot pedals comprise the operating controls, which are located in front of the operator. For more details write Publicity Dept., Bucyrus-Erie Co., South Milwaukee, Wisc., or circle **No. 7-3** on the reply card.

Koehring Crane Will Lift 90,000 Lbs.

Capacity to lift 90,000 lbs. with a 40-ft. boom, 11,000 lbs. more than its own working weight, is one of the important features of the new crawler mounted Koehring 545 Sprawler. Pivoting outriggers, used when making heavy lifts, are quickly swung into position and pedestals attached. When moving, the outriggers can be folded back to an out-of-the-way position alongside the crawlers, or can be removed completely. By stripping the unit for transportation, it is possible to reduce the shipping weight from 79,000 lbs. to 47,500 lbs. With the A-frame in a lowered position, the 545 can be moved through low clearance structures. Highest point with boom lowered is only 16 ft. ¼ in. This clearance point can be further reduced to 11 ft. 6 in., when boom and A-frame are removed. Complete information from Koehring Division, Milwaukee 16, Wis., or circle **No. 7-4** on the reply card.

Vacuum Sweepers For Airport Maintenance

The Wayne Mfg. Co. has been granted manufacturing rights by the Schorling Waggonbau Co. of Hanover, Germany, to produce the Schorling suction runway sweeper for sales in the United States and Canada. The unit will be called the Wayne Hi-Speed vacuum sweeper. The new sweeper employs a low pressure, high volume suction principle in addition to an exclusive nylon agitator system that has been proven most highly efficient. The sweeper can clean approximately 1,000,000 square feet per hour with sweeping speeds up to 25 mph. For full details write Wayne Mfg. Co., 1201 East Lexington, Pomona, Calif., or circle **No. 7-5** on the reply card.

Wayne Hi-Speed vacuum sweeper is used at airports that handle jet aircraft.

Carrier-Mounted Backhoe

Warner & Swasey machine has a full range of attachments

A new and improved carrier-mounted 3/8-yard Model 200 Hopto that can travel on the highway at speeds up to 50 mph has been announced by Warner & Swasey. This carrier has a 16,000 GVW rating and a 124-in. wheelbase. It is powered by a 265-cu. in. displacement engine and has 225 ft.-lbs. torque at 1200 rpm. It has a 13½-ft. digging depth, and a full range of quick change attachments including both backhoe and shovel buckets. Conversion to shovel operation is made by a simple change of buckets. Other features include a 200° uninterrupted swing, heavy duty box type boom construction, 180° wrist action digging, and individually controlled hydraulic outriggers. For full details write The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio, or circle **No. 7-7** on the reply card.

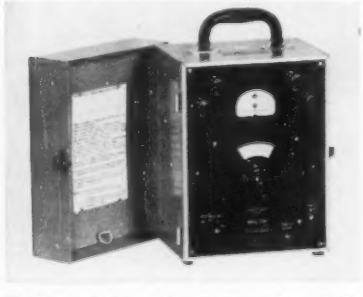
Dual Purpose Compactor

Steel and pneumatic compaction are combined in one machine

Ballast can be lightened or completely emptied in seconds in a new model of the Duo-Pactor introduced by Seaman-Gunnison. A dump-type ballast box, which eliminates need for removal of ballast by clamshell or hand shoveling, also allows the unit to serve as an 8-12 cu. yd. off-highway hauler. The new unit will carry 32,000-40,000 lbs. of ballast or payload, compared with weight of 18,000 lbs. when empty. A hydraulic lift raises the body for dumping. As a compactor, the rubber rolls are used to make the first pass or two; the steel roll can then be lowered to a level even with the bottoms of the ruts formed by the tires. Compaction tires for up to 125 psi inflation pressure are available. The unit is powered by a heavy-duty, 88-hp International tractor, modified as a two-wheel prime mover. For more details write Seaman-Gunnison Corp., 2763 S. 27th St., Milwaukee 15, Wisc., or circle **No. 7-9** on the reply card.

Geophysical Resistivity Survey Instrument

A new instrument developed for soil resistivity surveying, Model 274M Michimho Vibroground has been announced by Associated Research. The Vibroground is an invaluable tool for use in soils surveys connected with highway grades, foundations, slope designs and borrow sites. The Model 274M is designed to enable highway engineers and contractors to determine quickly and easily type, location, depth and extent of various soils and rock formations. Features incorporated into this instrument include: 1) Extreme field portability; 2) simple push-button operation; 3) high accuracy; and 4) rugged construction. Full information from Associated Research, Inc., 3777 West Belmont Avenue, Chicago 18, Ill., or circle **No. 7-6** on the reply card.



Tool used in soils surveys for roads

Versatile earthmover hauls a 21-ton payload at a speed of 31 mph or more

Self-Propelled Scraper

The Continental - Wooldridge scraper is designed and developed specifically to meet the demands of the earthmoving industry for a high speed, high production, self-propelled scraper. With a struck capacity of 15 cu. yds. (21 cu. yds. heaped), the Model CW 215 can haul 21-ton payloads at speeds in excess of 31 mph. Powered by a 240-hp. Cummins diesel engine, with a 10-speed forward and two-speed reverse transmission, the unit incorporates positive steering, and fast, easy loading in all types of materials. This is accomplished by boiling-bowl loading, adjustable angle cutting edge and long profile bowl design. Another feature is its interchangeability with the CWD 214, 25-ton rear dumper, which permits use of the same tractor for either unit. For more details write Continental Copper & Steel Industries, Inc., Wooldridge Div., Sunnyvale, Calif., or circle **No. 7-8** on the reply card.

New Road Marking Device

The new Perma-matic Liner, available from Veon Chemical permits 25,000 lineal feet of dividing line to be put down in a normal working day. One man, mounted on the machine, regulates the flow of the marking compound, the width of the line, and the length of each section of line. Reflector beads, mixed within the compound can also be spread along the top of the dividing line in a simple operation performed by the operator. The operator controls the whole operation from his seat on the machine by means of sound-powered phones rigged between the driver of the truck, and himself. For full details write Veon Chemical Corp., Long Island City, N. Y., or circle **No. 7-10** on the reply card.

Small Diameter CI Pipe

The Glamorgan Pipe and Foundry Co. has announced the availability of cast-iron pipe in 2-in. and 2¼-in. diameters in the 150 and 250 psi classes. Suitable for building and house services and piping in small water systems, this new line brings the advantages of cast-iron pipe to these phases of water service. The small diameter pipe is cast in metal molds and is supplied with bell and spigot or standardized mechanical joints. For more information write Glamorgan Pipe and Foundry Co., Lynchburg, Va., or circle **No. 7-11** on the reply card.

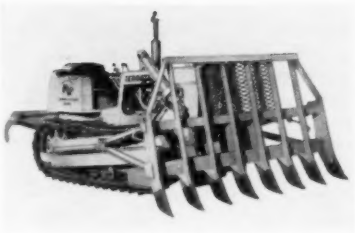
Trojan Tractor Shovel Has Capacity Range of From 14 to 29 Cu. Ft.

The Contractors Machinery Division is now offering the Trojan T-18, a new tractor shovel with six interchangeable buckets of 14, 16, 18, 20, 22, and 29-cubic foot capacities. The unit has a capacity of 2,500 pounds and is powered by a 6 cylinder, 230-cu. in. displacement, Model 30

Chrysler engine developing 72 hp. The elimination of the clutch pedal and manual gear changing sharply reduces driver fatigue and increases the overall operational speed. With a top speed of 13.75 mph, in both forward and reverse, the T-18 accelerates from 0 to 8 mph in only 3.5 seconds, and to full speed in only 5.5 seconds. It has a dumping clearance of six feet and a dump angle of 46° to allow for full and quick clean-out of the bucket. Full information from The Yale & Towne Mfg. Co., Contractors Machinery Division, at Batavia, N. Y., or circle **No. 7-12** on the reply card.

Case TerraTrac Rootrakes Speed Land Clearing

Heavy-duty brush rakes designed to speed land clearing are now available as an interchangeable attachment for Case TerraTrac Model 800 and 1000 dozers, and the new Model 1000 tractor shovel with rear hinged bucket. Fabricated of heavy



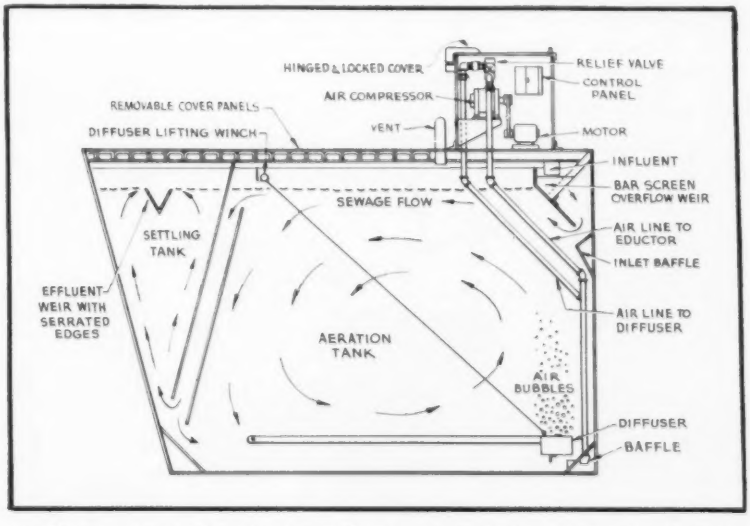
steel plate welded into a single unit, the rakes can be used in place of a moldboard on power-angling and power-tilting dozers, or in place of the shovel bucket, and are operated with the same hydraulic system. Eight wear-resistant carbon-steel teeth are welded to a heavy box section to provide extremely rigid construction. Ribs extend high above the frame to prevent brush from spilling over the top and endangering tractor or operator. Both dozers and tractor shovel feature extremely high lift, which is an advantage in pushing over trees, and stacking material for burning. For full details write J. I. Case Co., Racine, Wis., or circle **No. 7-13** on the reply card.

2-Speed "Hi-Lo" LimiTorque Actuator

LimiTorque now has available a complete new design "Hi-Lo" 2-speed attachment, which is a magnetic clutch actuated gear reduction unit. The "Hi-Lo" attachment is mounted between the motor and the LimiTorque housing, and permits operation at either of two "speeds," and is capable of changing speeds under load. It permits hi-speed valve operation and still retains the slow speed seating characteristics required by most valves. The "Hi-Lo" attachment to the LimiTorque valve unit fits it for special requirements of water works and sewage treatment plants, where normal operating conditions require low or medium speed operation, but under emergency conditions fast speed operation is necessary. Line surge or hammer is reduced under emergency hi-speed operating by changing to low speed operation prior to seating. Further information from Philadelphia Gear Corp., Erie Ave. and "G" St., Philadelphia 34, Pa., or circle **No. 7-14** on the reply card.

Sewage Treatment Plants For Small Installations

A low-cost factory-built sewage treatment plant, the Oxigest, for subdivisions, schools, motels and industrial plants has been added recently to the Smith & Loveless line. The Oxigest is a permanent sewage treatment plant, requiring minimum maintenance. It has been carefully engineered for dependable treatment without the necessity of a skilled operator. The shot-blasted steel structure is completely protected by Smith & Loveless Versapox coating and magnesium anodes, and is properly reinforced to withstand interior and exterior pressures. Oxigest plants are available in five standard sizes. Complete information available from Smith & Loveless, Inc., P. O. Box 8884, Kansas City 15, Mo., or circle **No. 7-15** on the reply card.



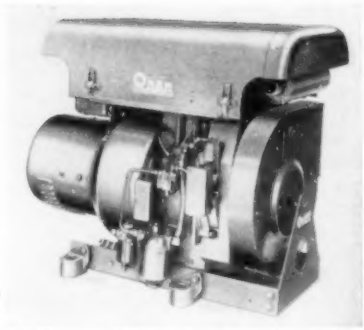
Smith & Loveless Oxigest treatment plants are manufactured in five standard sizes

Henry Mark III Backhoe

Utilizing a new type hydraulic swing cylinder giving a maximum continuous arc of swing of 200°, the new Henry Mark III backhoe is designed especially for crawler tractors. In addition to the new type rotary swing cylinder, the backhoe mounts close to the rear of the crawler tractor with a quick detachable mounting requiring only two pins. It digs to a maximum of 12 ft. 6 ins. with a loading height of 8 ft. 6 ins. The unit has two individually controlled hydraulic outriggers with a span of 9 ft. 8 ins. for greater digging stability. There are 12 different large capacity bucket sizes, ranging in width from 12 inches to 38 inches, plus 4 different sized moles-paw buckets for attachment to the backhoe. In addition, a pipe pusher rounds out a complete list of versatile attachments. For full details write Henry Mfg. Co., Box 521, Topeka, Kans., or circle **No. 7-16** on the reply card.

Onan Introduces "Vacu-Flo" Cooled 3-KW Diesel Electric Plant

A new 3,000-watt air-cooled diesel electric generating plant is announced by D. W. Onan. The highly efficient vacuum cooling system employs a powerful centrifugal blower that pulls cooling air through the generator and over the heated engine parts, then expels the heated air through a duct to the outside. With Vacu-Flo, this new unit automatically ventilates the compartment or room where it is installed, and the super-quiet muffler assures quiet, smooth-running performance. Because of their compact size and unique cooling system, the new Onan DSL models are highly suited for either mobile or portable uses. On construction jobs where reliable electric power must be supplied independently to operate floodlights or modern electric tools, these new



Units are for the construction field

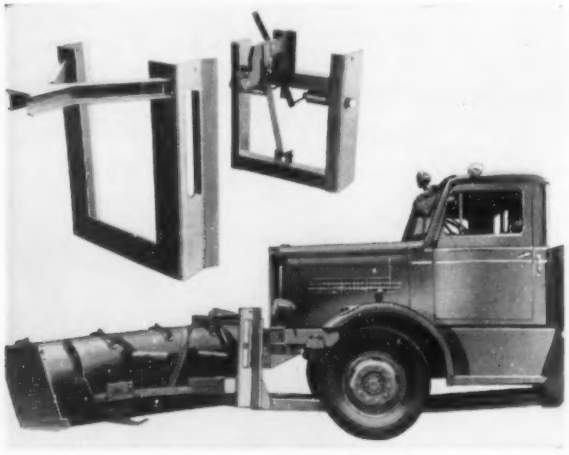
diesels meet the most critical requirements of mobility and heavy-duty service. Weighing only 470 pounds, Model DSL can be taken anywhere in its own high-speed trailer or can be easily installed in any pick-up truck or other vehicle. For more details write D. W. Onan & Sons, Inc., Minneapolis 14, Minn., or circle **No. 7-18** on the reply card.

Backhoe for John Deere Tractors

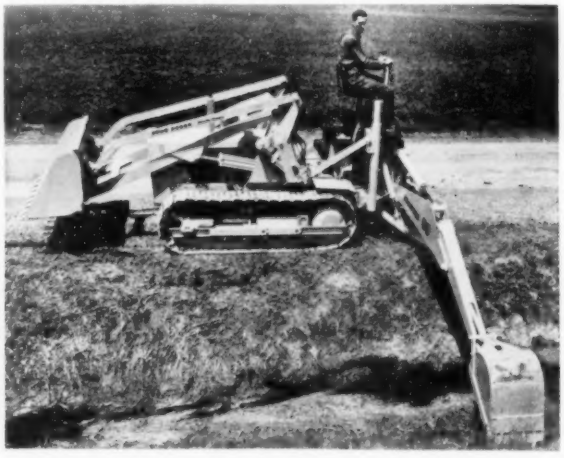
The Shawnee 88 backhoe can be used on the John Deere 440-I tractor in connection with the John Deere 71 loader, and also for mounting on the John Deere 440-IC crawler in conjunction with the John Deere 91 loader. It features a clean, modern design with all hoses and cylinders covered and protected. A simplified hydraulic system eliminates the need for extra by-pass valves, reducing the necessity for adjustments. The Shawnee 88 has a 180° uninterrupted swing, featuring automatic wear compensation. The backhoe attaches to the tractor by four pins. It loads 9 ft. 9 ins. and digs 12 ft. For more details write to Shawnee Mfg. Co., 1947 Topeka Ave., Topeka, Kan., or circle **No. 7-19** on the reply card.

Quick Snap Coupling For Snow Plows

Forage Master Mfg. Co. announces the recent introduction of a new economical snap coupling for snow plows. The coupling embodies a patented Husting hitch, and enables one man to snap-couple a snow plow and truck in three seconds without leaving the cab. The coupling permits any truck to be used with any plow. In case of breakdown, it takes only seconds to attach the plow to another truck. Lateral plow motion also permits moving the blade up and down with blade parallel to road. There is no need for tilting and resulting loss in scraping efficiency. More details from Forage Master Mfg. Co., Allenton, Wisc., or circle **No. 7-17** on the reply card.



Coupling is used with any make plow and is easy to attach



Shawnee backhoe attaches to the Deere tractor by four pins

Incinerator Grapples

The new grapples on the TI-150 and TI-250 Blaw-Knox incinerator grapples are now equipped with cast Hadfield 12-14 percent manganese steel tines. An important feature of the new tine is that it will bend rather than break when it is subjected to heavy blows as are constantly experienced in typical incinerator operation. Each tine is held in place by two keys. The top key is fully enclosed so that it cannot be hit while the bucket is in operation. The bottom key is installed in such a manner that it is protected from blows during normal operation. For further details write Blaw-Knox Co., 300 Sixth Ave., Pittsburgh 22, Pa., or circle **No. 7-20** on the reply card.

Gear Assembly Developed For Hypreseal Wrench-Operated Valves

Gear assembly is made in three sizes

A lightweight planetary gear operator which adapts wrench-operated Rockwell-Nordstrom Hypreseal valves—used on high pressure water service—to gear operation has been developed by the Rockwell Mfg. Co. Easily installed by one man, it has a 5-1 gear ratio and a 4-1 mechanical advantage. One turn of a wrench or handwheel will close or open the valve. Developed primarily for valves already in service the gear operator fits directly over the square plug stem and down over the body of the valve. No special wrenches or handwheels are needed with the gear operator since the wrench normally used will fit easily over the operating pinion. This assembly is for 2 to 6-in. valves used in water systems. For further information write Rockwell Mfg. Co., Meter and Valve Div., 400 N. Lexington Avenue, Pittsburgh 8, Pa., or circle **No. 7-21** on the reply card.

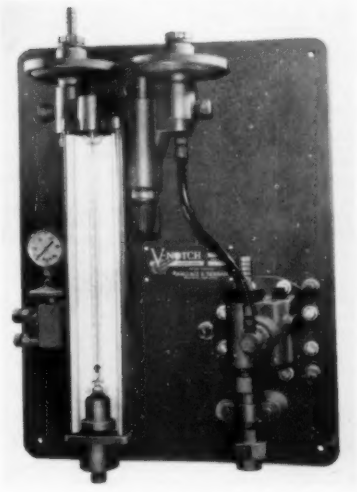
Vacuum Sweeper For Lawns and All Outdoor Areas

The unique Mulch-Vac heavy-duty vacuum sweeper for lawns and other outdoor areas has been added to the product line of Good Roads Machinery. Designed for leaf and litter removal from parks, cemeteries, golf courses and other areas the Mulch-Vac is equally valuable for clean-up of parking lots, sidewalks and drives. It chops whatever it picks up into fine particles. Leaves are thus thoroughly mulched into fine natural fertilizer for discharge back on the lawn. A bag is furnished with the unit to catch the chopped leaves, if preferred, and to catch chopped litter. The standard machine is self-propelled and has a 6-hp 4-cycle engine.. A towed-type heavy-duty model has a 25-hp engine and sweeps a path 6 ft. 5 ins. wide. For full details write Good Roads Machinery Corp., Minerva, Ohio, or circle **No. 7-22** on the reply card.

Hough To Add New Model With More Capacity

A rubber-tired, front-end loader with a rated carrying capacity of 2,500 lbs. has been announced by Frank G. Hough. It has a turning radius of 6 ft. to the outside rear hub and power-steering is a standard feature that assists both maneuverability and ease of handling. A new power-shift transmission and new torque-converter are matched to provide the maximum in speed of movement and ease of operation. The power-shift transmission is full-reversing and has two speeds. The unit is being offered with a choice of gasoline, diesel or LPG power. For handling of dense, compacted materials, it has a breakout force of 4,500 lbs. and, like other Payloader front-end loaders, provides a bucket tip-back of 40° at ground level. This latter feature permits loads to be carried lower and closer to the machine thus providing exceptional stability and better balance. For more data write The Frank G. Hough Co., 761 Seventh Ave., Libertyville, Ill., or circle **No. 7-23** on the reply card.

V-Notch Chlorinator



A new V-notch chlorinator for low-capacity installations is now available from Wallace & Tiernan. The Series A-741 chlorinator is wall-panel mounted and requires no floor space. No auxiliary water or drains are required. A V-notch variable-orifice gives precise and smooth feed-rate adjustment, and all parts are made of corrosion-resistant plastic, molded for interchangeability. Vacuum operation gives protection against chlorine leaks. The addition of simple auxiliary apparatus, which interrupts the water supply, provides semi-automatic operation of this economical chlorinator. For more data write to Wallace & Tiernan Inc., Belleville 9, N. J., or circle **No. 7-24.**

Correction on GE Luminaire

The General Electric "Power Pack" 400-watt mercury vapor luminaire with an integral ballast is equipped with glass refractors only, and not with an acrylic refractor as reported in our May issue. The shatterproof acrylic refractor is a feature of another new unit, designated the Form 400C. This unit will accommodate 250-watt lamps as well as the 400-watt size, and can be provided with IES Type II, III or IV distribution patterns with either lamp.

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The Village of Glencoe, Ill., desires applications for Assistant Director of Public Works. Salary range is $400 to $500 per month; a degree in engineering and two years of experience are required. The Dept. of Public Works is responsible for water plant operation, street construction and maintenance and street cleaning and includes all engineering. Write the Village Manager, Village Hall, Glencoe, Ill.

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There is an opening for Assistant Water Distribution Supervisor in the City of Philadelphia, Pa. Four years of experience are required and education equivalent to 12th grade, or a suitable combination of the two. Residence in the city is not necessary. Salary range is $4606 to $5784. Address Personnel Dep't., 127 City Hall, Philadelphia 7, Pa.

Research assistants in Sanitary Chemistry leading to M. S. and Ph. D. degrees are available at the University of Florida beginning with the fall semester of 1958. Students selected will work on a Public Health Service research grant project involving basic studies in water coagulation. Interested students should contact Dr. A. P. Black, Research Professor of Chemistry, University of Florida, Gainesville, Florida.

• • •

Air Pollution Courses Started

The University of North Carolina's Department of Sanitary Engineering in the School of Public Health has announced courses in air hygiene and air pollution control. Made possible under a grant from the U. S. Public Health Service, the first of these courses has been initiated, with expansion to three next year. These are open to students working toward the degrees of MSPH, MPH, MSSE. The plan provides for a concentration in air pollution control based upon the principles of air hygiene, which may concurrently fill the prerequisites of courses in industrial hygiene. Inquiries should be addressed to Dr. D. A. Okun, Box 899, Chapel Hill, N. C.

NEWS OF ENGINEERS

MARION BORISS is the Director of Public Works for the Dade County Metropolitan Government, Fla. Prior to assuming this position on May 26, he was Assistant Director of Public Works for Miami. Previously he had been City Engineer of Chattanooga, Tennessee, and Sanitary Engineer for Jefferson Co., Alabama.

THOMAS P. BROWNE II, export manager of The Permutit Co., is the new president of the Inter-American Association of Sanitary Engineers. He was elected at the meeting recently held in San Juan, P. R.

B. P. THOMAS and H. T. HARSTAD have formed the consulting engineering firm of Thomas Harstad Associates, with offices in the Volkor Bldg., Seattle, Washington. They will specialize in electric power generation and distribution. B. J. Qualheim is Assistant Chief Engineer and D. B. Diehl, R. W. Okey, R. R. May, J. W. Porter, Arthur Lie and J. A. Nelson are project engineers.

ROBERT W. McDANIEL has joined the staff of Bernard Johnsen & Associates, Consulting Engineers of Houston, Texas. Formerly with Armco, Mr. McDaniel is a civil engineering graduate of Texas A & M and a registered professional engineer.

JOHN K. HOSKINS, long-time leading Sanitary Engineer of the Public Health Service, died May 16 at his home in Chevy Chase, Md. A member of the engineering staff of the Public Health Service from 1913 to his retirement in 1948, he served as Assistant Surgeon General and Chief of the Sanitary Engineering Division during most of the war period and until 1948. He organized and administered the World War II program of sanitary engineering in a manner that contributed greatly to the war effort.

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by Arthur K. Akers

★ JOHN W. SPOOR is new president of Seaman-Andwall Corp., Milwaukee, subsidiary of American-Marietta Co.

★ G. J. MANAHAN is another of our friends who has moved up—to a vice presidency with A. P. Smith Mfg. Co., East Orange, N. J. He will continue to direct sales also.

Mr. Manahan

Mr. Deakin

★ DONALD DEAKIN is appointed sales engineer for Smith-Blair Inc., headquartering at the Greensburg, Pa., branch of this South San Francisco water works supply company.

★ ROBERT D. BUTLER becomes assistant to Sales Manager W. A. Dormley of W-K-M Division of ACF Industries Inc., on plug valves, at Houston, Texas.

★ WILLYS SALES CORP. (Jeeps to you) names C. M. Ritchey director of advertising and merchandising, and James Beattie, Jr., assistant general sales manager.

★ R. D. WOOD COMPANY, Philadelphia, announces Kenneth F. Pogue to succeed the late F. Victor Sohle as Southwest sales representative at their Dallas office.

★ CHARLES N. LOCKWOOD is new sales manager, Cloroben Chemical Corporation, South Kearny, N. J. See Cloroben's advertising in PUBLIC WORKS for the product story.

★ SMITH & LOVELESS Inc., Lenexa, Kans., announces M. Ray Golly as their new chief sanitary engineer, formerly with Greeley & Hansen, consulting engineers.

★ AMONG recent very large contracts announced is that let to National Power Rodding Corp., Chicago, to clean and rehabilitate 70 miles of sewer lines at Fort Benning, Ga. The job is to be completed in 90 days, according to Harold Rudich, president of National.

★ HIGHWAY EQUIPMENT CO., Cedar Rapids, appoints Gale E. Allen, general sales manager.

★ CHARLES KUHN is named sales manager, Regular Products, for Dresser Mfg. Div., Bradford, Pa. He succeeds H. Z. Hight, now president of Bonded Products, Inc.

★ MASSEY-FERGUSON Industrial Div., Wichita, Kans., promotes Bill Talmage to general industrial sales manager. Line includes Davis Loaders, Backhoes, etc.

★ DORR-OLIVER Inc. elects Albert L. Morris and J. B. Hoxie, vice presidents, company relations and

Mr. Morris

Mr. Hoxie

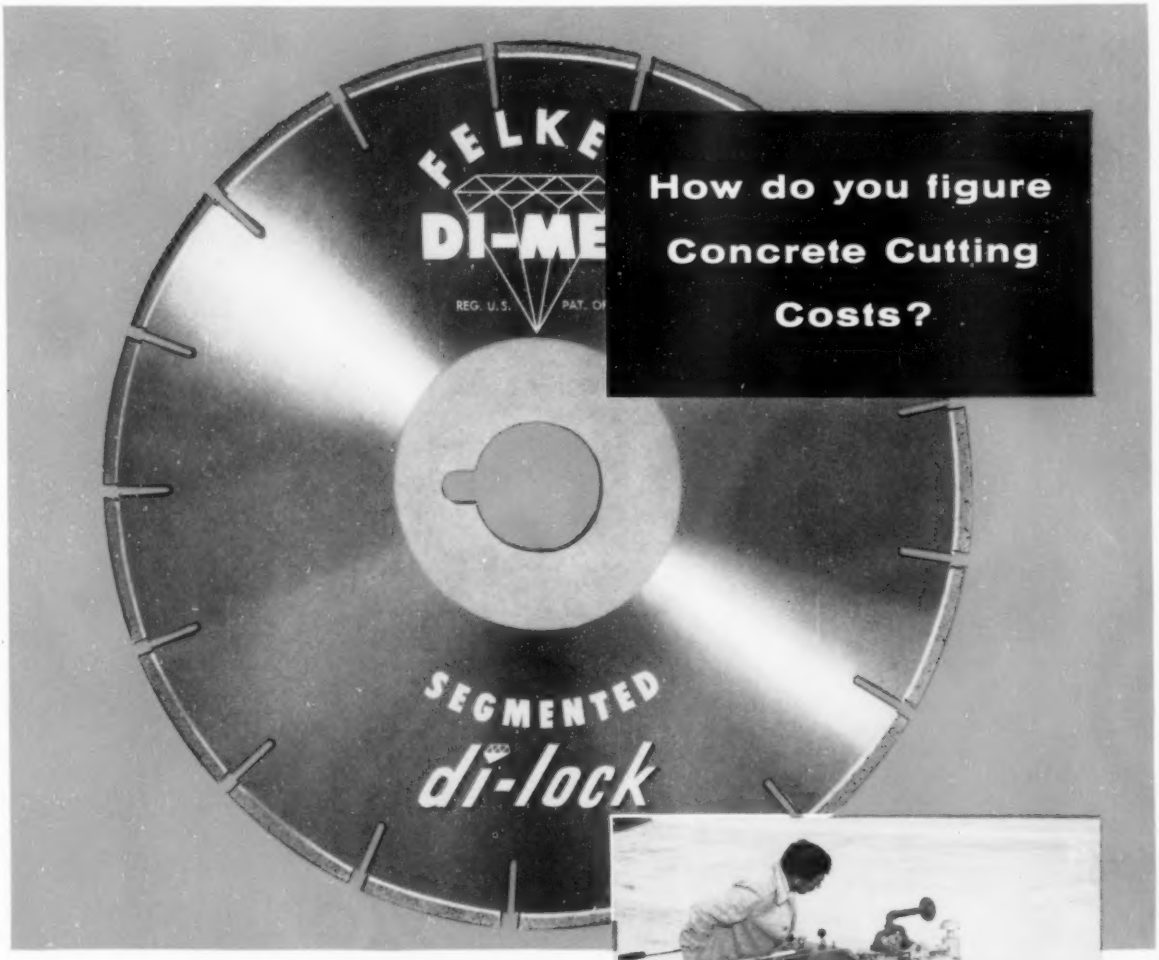
production, respectively. "Al" Morris continues over-all administration of Dorr-Oliver corporate, public and personnel relations, at Stamford, Conn.

★ A. W. CASH Valve Mfg. Corp., Decatur, Ill., names Ralph D. Hiser sales manager.

★ STERLING MACHINERY CO., Division of Essick Mfg. Co., appoints William A. McMahan sales manager.

★ THE SINISTER note read: "If you don't send $1,000 immediately, we'll kidnap your wife."

Answer: "I don't have that much money but I'm interested in your proposition."



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On a large airbase job the contractor had 450,000 lineal feet of control joints to be sawed to a depth of 3½ to 3¾ inches. When bidding this job he estimated blade costs at 25 cents per foot—a figure which he felt dangerously low for the conditions encountered. Here's how the job shaped up in actual production.

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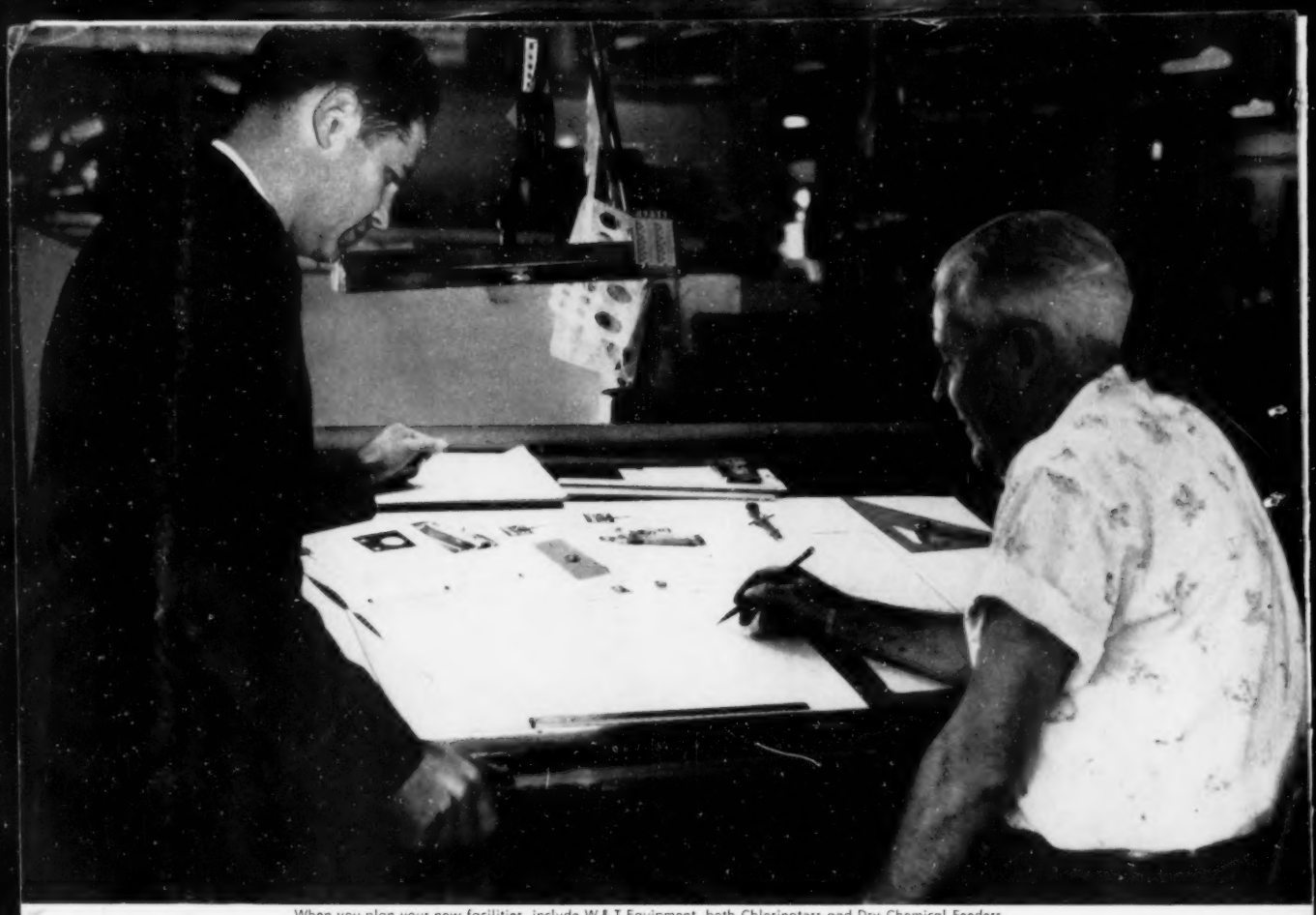

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